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Improved Railway Journal Boxes Wanted.

The present method of applying oil to the axles of railway cars is to take a quantity of fibrous material like waste or rags and saturate it with the lubricating material, and stuff the space in the box underneath the axle full of this saturated material, so that it is in contact with the journal. At the back of the box there is a more or less ineffectual attempt at making a tight joint to prevent oil from leaking out and dust from getting into the box. That these attempts are ineffectual is shown by the condition of the wheels, which in most cases are covered with grease. There must be great uncertainty about the packing waste being in contact with the journal after the box has run a long distance and the contents of the box have been subjected to the consolidating effects of the jar and concussions of the road. This is, perhaps, the best practicable means of effecting this purpose; but it must be admitted that it is a very rude contrivance for doing it.

Our object in calling attention to the defects in the means employed and the methods adopted for lubricating cars is to account for the constant and almost universal annoyance from hot boxes. A record kept on one line showed that in one month there were 3,034 hot boxes. We take the foregoing from the *Railroad Gazette*. It is indicative of the great demand there is at the present time for improvements in railway journal boxes. The aggregate length of American railway lines is now about eighty thousand miles. The consumption of oil, grease, and waste for lubricating car wheels is enormous; and the delays, accidents, and damages from hot boxes very great. It does seem as if some ingenious mind could invent a simple improvement that would obviate all these evils. On this head our cotemporary makes the following suggestions:

"The lubrication of railroad cars is a much more complicated subject than at first sight appears. Not only is it a question of the quality of the lubricants used, which is of itself still involved in much darkness, and the secrets of which will perhaps not be revealed excepting to the earnest interrogations of mechanical, chemical, and microscopic science, but there are questions of material and proportions of the journal and journal bearing, and construction of the oil-box itself. Let any one talk with a manufacturer of journal bearings for cars, and he will learn that there is very great diversity of opinion with reference to the material and methods of manufacture of such bearings. Brass compounded in various ways, phosphor-bronze, Babbitt metal, lead, etc., all have their advocates. The manufacturer will tell you that, if railroad companies were only willing to pay a fair price for good bearings, there would be very much less difficulty with lubrication. Now, undoubtedly the material which forms the bearing is a very important element, but it is obvious that, as the journal rubs against the bearing, the quality of the former is just as important a factor in the question of friction as that of the bearing is.

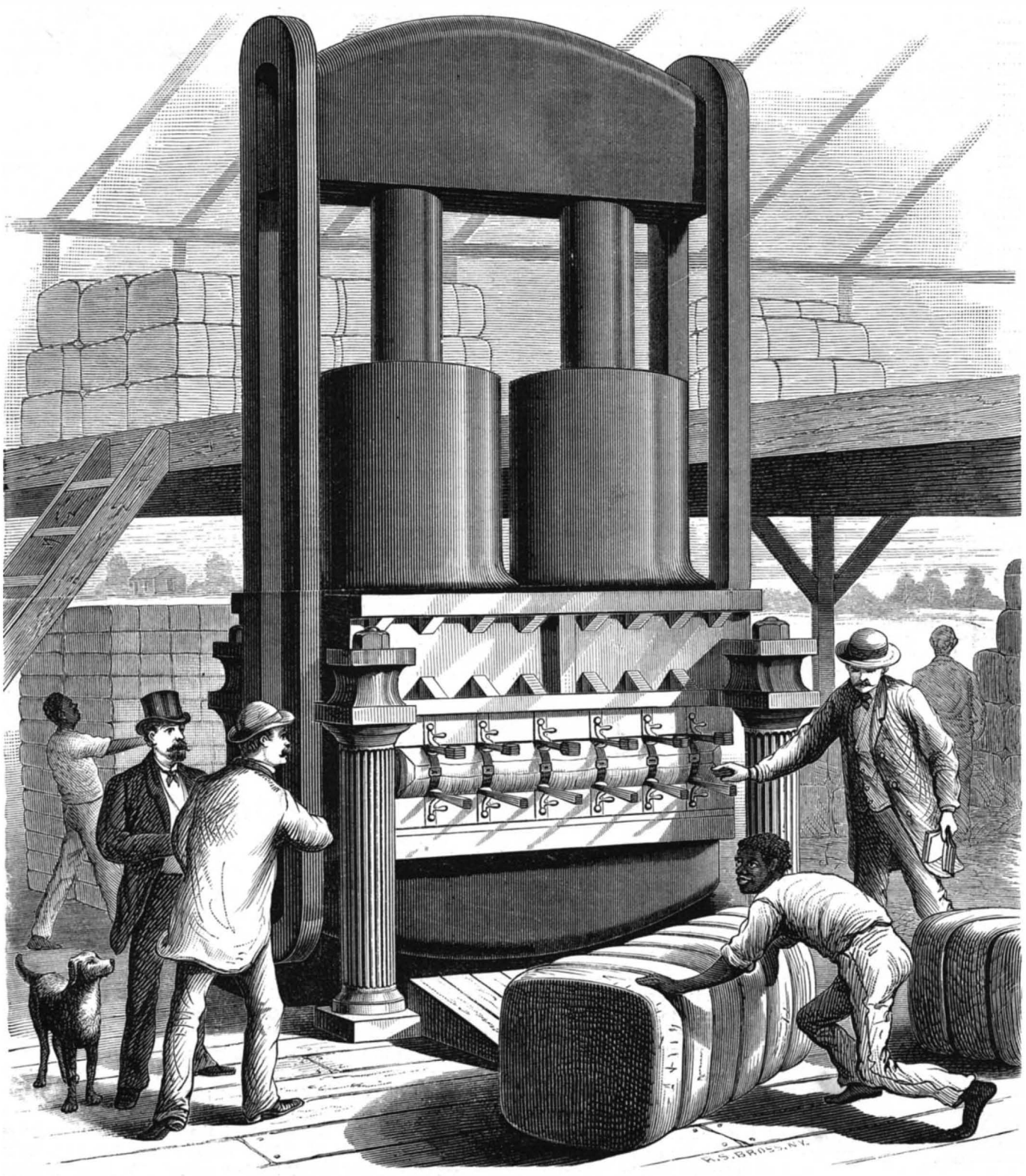
IMPROVED METHOD OF COMPRESSING COTTON.

Since the close of the late civil war, much attention has been given to the problem of putting the cotton crop of America into such shape as to give vessels and rail lines the greatest possible revenue from its carriage.

To a great extent this has been brought about by the fact that since the above period railroads have been active competitors for this business. Prior to the war no cotton was carried by rail from the South direct to spinners, Northern markets, or for export; while to-day it forms a very important element in the business of our great trunk lines. Not only is cotton now carried overland direct to our American mills, but in all important centers bills of lading are given by the rail lines to all points in Europe, and the exchange is sold against these bills to local banks at these points. Memphis, Nashville, St. Louis, Montgomery, Selma, and other cities afford buyers and shippers export facilities to-day equal to New Orleans or Savannah. For the crop year just closing it is no exaggeration to say that the trunk lines of the North have carried 1,000,000 bales. This revolution has been brought about by the compress.

In 1865, a car load of compressed cotton consisted of 30 to 35 bales. To-day, from 40 to 45 bales, weighing 20,000 lbs. is the standard. Low rates and the most rigid economy are now compelling an advance in the last named tonnage. Cars capable of carrying 25,000 to 30,000 lbs. are replacing the old standard of 20,000 lbs. Improved road beds and bridges are making these loads safe and economical to move. And now the rail lines are demanding heavier loads.

The object of the invention herewith illustrated is to accomplish this point. Band stretchers, pulleys and tighteners, and devices of such nature usually require special fastenings, thus compelling the compress to throw out the buckles that come on the cotton and substitute others adapted to the tightening mechanism. This is expensive. The use of the stretcher involves considerable loss of time and may reduce the work of the compress from 70 to 35 bales an hour.



BURR'S IMPROVED METHOD OF COMPRESSING COTTON.—Fig. 1.

Mr. Burr's method, it is claimed, allows the employment of any fastening in use, and, instead of reducing the capacity of the compress, increases it. The bed or saddle of the press and, B, the follower or bottom block, to which the platens are attached, are shown in Fig. 1. These platens have fixed ribs, A, Figs. 2 and 3, running transversely across their faces. At B are blocks placed in the spaces between the ribs and having a thickness equal to the height of the ribs and a length equal to the width of the bed. These blocks are provided with two or more guide rods, C, that pass through the plates, D, and are secured by the check nuts, as shown. These nuts, besides acting as guides, regulate the height to which the blocks, B, rise. Recesses are formed in the blocks, B, to receive springs of rubber, E. These springs surround the guide rods, and bear the blocks upward with such force that their combined action is more than sufficient to hold up the superimposed bale. Twenty to thirty bands cut to proper length are fastened by twine into a snug bundle and the buckles fastened on the ends, as shown in Fig. 4. These bundles are laid up-

[*Continued on page 162.*]

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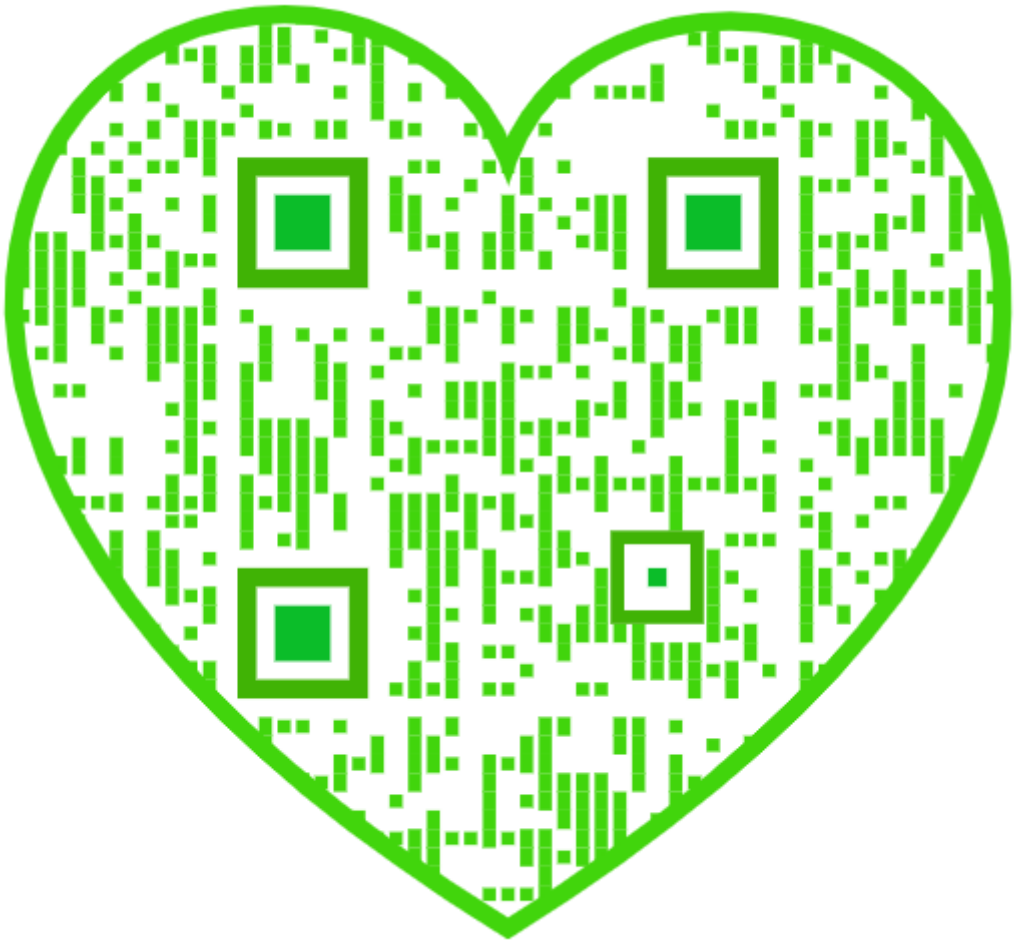

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NEW YORK, SATURDAY, SEPTEMBER 15, 1877.

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AMERICAN FRUIT IN FOREIGN MARKETS.

Hitherto, for the most part, the least profitable seasons for fruit-growers have been those of most abundant crops. Not unfrequently the waste of fruit for lack of means for getting it to market, or to markets not already over-stocked, has amounted to millions of dollars' worth in a single season; a recent and intelligent estimate puts the loss for such seasons as high as $15,000,000.

Thanks, however, to the ingenuity of our inventors, American fruit-growers no longer need to see the best fruits of their labors, the most bountiful gifts of Nature, made practically valueless by local plethora, while half the world is longing for a taste and willing to pay a good price for the unattainable luxury. Rapid transit, refrigerating ships and cars, and other means of forwarding fresh fruits to great distances have widened enormously the market for such products; while contrivances for drying, preserving, canning, and so on have lately been so multiplied and improved as to make it possible not only to prevent wholesale waste of fruit, but to secure for distant or future use the whole crop of the most abundant years. As a natural consequence, fruit raising promises to furnish from year to year a wider and more regular source of profit; and every year's inventions will help to make the industry more and more remunerative and sure.

The home market for fruit, fresh and canned, is already co-extensive with the whole country, and the fruit season lasts the entire year; the foreign market widens almost as rapidly. The following figures, from an extended review of the condition and prospects of the export trade, printed in the *Tribune*, shows the progress made during the past sixteen years, the years severally ending July 1st.

1861	$ 269,000	1870	$ 542,000
1862	238,000	1871	509,000
1863	364,000	1872	804,000
1864	865,000	1873	1,703,000
1865	1,001,000	1874	990,000
1866	492,000	1875	1,633,000
1867	380,000	1876	827,000
1868	406,000	1877 (11 mos.)	2,831,000
1869	306,000		

This for the exportation of fruit to Europe. Considerable quantities go also to Australia, South America, and the West Indies. The large figures for 1865 are owing, in part, to the exportation of fresh apples, which was then begun on a considerable scale; the business being fairly established in 1873. Since October, 1876, the shipments to England—mostly baldwins, greenings, russets, and Newtown pippins—have amounted to nearly four hundred thousand barrels, always at remunerative prices. Circulars recently issued from Liverpool state that as a result of the season's trade a preference for American apples has been established in England, and that hereafter, whether the English crop is large or small, large supplies of well selected American fruit are likely to find a good market there. The capacity of the English market for fresh peaches and pears has not yet been tested. There is reason to believe, however, that it will be limited solely by the capacity of our refrigerative ships to land supplies in good condition. The foreign market for canned peaches is almost unlimited, upwards of seven hundred thousand dollars worth having found a lively demand abroad during the first ten months of the season of 1876–7. And dealers are unanimous that, for the present, peach-growers will do better to can their surplus crop rather than dry it. The foreign market for dried peaches has yet to be tested. If the recently invented evaporators prove capable of drying large quantities cheaply and well, the demand for dried peaches abroad may be indefinitely increased. At present the price is too high to tempt the working classes to buy, and they are our principal customers for dried fruit, particularly those of Germany. The poor people of England and Russia buy to a limited extent; France is also a buyer, but whether for domestic use or for distillation is not positively known. The miners of Australia are also large buyers, but there is not much reason to count largely on a permanent market there. Fruit growing is increasing rapidly in Australia, and before many years the colonies in that quarter of the world must be able to supply at home the home demand. The demand for dried apples in Europe and Australia is now very great, so long as the price does not exceed seven cents a pound; at five cents the market is practically unlimited. Last year something like fourteen million pounds were exported. Curiously sliced apples, though really better than the quartered, will not sell at all abroad. Foreign buyers want them cut in pieces as large as possible, the larger the better. The manner of packing is also important. For the European market the packages must not be smaller than barrels, and hogsheads are preferred. Australia, on the contrary, will not have packages as large as barrels. For that market the apples must be put up in 55 lb. and 100 lb. kegs, suitable for transportation to the interior on the backs of mules. Venezuela also demands small packages.

INDIGESTIBLE MEDICINES.

It is not an uncommon blunder for young or ignorant physicians to write prescriptions, the ingredients of which chemically reacting upon each other produce substances wholly different in nature and physiological effect to those intended to be administered. Not long ago we noted an instance of how two harmless drugs when combined formed a highly poisonous mixture, and it may so happen that innocent mendicaments may unite to produce a compound dangerously explosive. For the knowledge that still another danger lurks in the apothecary's vial we are indebted to Dr. J. W. Compton, of Evansville, Indiana, who has called the attention of physicians to the frequent indigestibility of their curative potions. If medicines are not dissolved in the digestive fluids of the stomach and intestines they can never be absorbed: if not absorbed they can never enter the circulation and hence cannot produce the results intended. There are various diseases which affect these fluids. Thus, they may be carried off by hœmorrhage and sweats, in some maladies the saliva may be withheld, in others the gastric juice becomes deprived of its solvent principles or may be arrested, liver ailments may withhold the alkaline bile, and so on; so that the medicine, especially if solid, instead of producing the slightest good, acts merely as an irritant and foreign substance, and occasions at best loss of valuable time. Dr. Comstock gives several striking instances of invalids rejecting medicines in an unaltered state, the drugs being in all instances given in the form of pills, and he calls especial notice to the fact hitherto apparently overlooked that if, in a depraved state of digestion from disease, solid food cannot be digested for the nourishment of the patient, solid medicines cannot be digested and appropriated to the cause of disease. Dr. Comstock, we think, might have gone a step further and questioned how far all large doses are beneficial, or in other words how much of the dose does the work and how much is simply excess and consequently foreign matter. The homœopathic practice of medicine furnishes any number of instances where infinitesimal quantities of specifics produce the most marked effect, certainly an effect as plainly apparent as that resulting from a large dose allopathically given. Now if the combining equivalents, so to speak, for a given result are present in one case, they are equally so in the other, the end reached being the same. Hence in the latter example it follows that a very large proportion of the dose is useless if not harmful, while it usually has the further demerits of being expensive and distasteful.

THE SUGAR INTEREST IN PERU.

BY PROFESSOR JAMES ORTON.

It is singular how exotics are becoming the ruling objects in Peru—Europeans, horses, sheep, sugar-cane, coffee, oranges, grapes, bananas, wheat, eucalyptus tree, etc. Peru, though rich in minerals, was never plentifully supplied with useful animals and plants; but possessed of every conceivable variety of climate and soil, she has shown herself capable of giving a congenial home to every form of life. Northern and Southern Europe can meet in this little Republic.

Among the foreign introductions, always excepting the immigration of Europeans, the sugar-cane is the most important. Better than guano or saliter, it is destined to be the surest and most inexhaustible source of the wealth of Peru. The annual yield of sugar and spirits is estimated at $20,000,000. The recent rise in the price of sugar has given a new impulse to its cultivation, and the prospect is that Peru will ere long be a formidable rival of Cuba and the other Indies. The usual cane crop in the West Indies is 1,130,000 tuns; in Java, 200,000; in Brazil, 170,000; in Louisiana, 75,000; in Egypt, 40,000. The crop in Cuba last year was thirty per cent below that of 1875, while the beet crop in France and Germany was well nigh a failure. In 1875, Peru exported 60,000 tuns; in 1876, over 70,000. That amount will be greatly increased this year, provided laborers can be obtained. But thousands of acres are lying idle for want of hands. In fact, the commerce of Peru is diminishing for lack of labor and capital, and Peruvian statesmen are anxiously looking to China for the one and to Mr. Meiggs for the other. The squint-eyed Celestials outbid and outdo the the mongrel races along the coast, and the mountaineers cannot endure the lowlands. But Chinamen must be better treated than they have been. Even now, great as is the demand for foreign labor, the natives, as in Trujillo, would persecute the Asiatics and drive them from their shore.

In no other country, save Egypt, is the cane crop so sure as in Peru. Occasionally, as in 1871, the crop may suffer by drought from want of the supply of water from the sierras; but in the course of ten years, the decrease would not amount on the average to more than twenty-five per cent. As the cultivation is regulated by irrigation as in Egypt, Peru has an advantage over Cuba, where planters depend on the weather. At present, Peru can compete with any other country, save Egypt, since she can grow the cane without intermission. The slave labor of Cuba cannot produce it so cheaply. The cane grows more slowly than in Louisiana, and hence is richer in saccharine matter. The amount of juice to the cane is about sixty-five per cent, and its average density is 10°. In Northern Peru, two tons of cane give four hundred gallons of juice, each gallon yielding 1·35 lb. of sugar. The best season for planting the cane is November, and the yellow variety (originally from India) is preferred to the red, being richer. The first planting takes fifteen months to mature; after that, the crops ripen every twelve months. This is true only of Northern Peru, where the soil is thinner but more tropical than at the south; in Cañete, for example, it takes fully two years for the first crop to mature. Three or four crops are obtained before replanting is necessary. The green and ripe cane are seen in the same field; there is cutting on one end and planting at the other; so that the ground is never idle. The actual time spent in the manufacture of sugar is eight months; the rest of the year is occupied in repairing acequias, etc. From the small establishments, the sugar is exported in the crude "concrete;" in the larger mills, it is first refined. For inland transportation, western Bolivia being supplied from Peru, it is put up in conical loaves, weighing 45 lbs. each

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Under the present American tariff, refined sugar goes by New York to Europe, the law favoring the New York refiners without benefiting the consumer or the Government revenues. Then, too, the Hawaiian Reciprocity Treaty, allowing free importation of sugars from the Islands, tends to turn the sugar of Peru across the Atlantic.

The sugar cane is cultivated on both sides of the Andes, but it does not grow at a higher altitude on the western slope than 4,500 feet, while on the eastern side its limit is 2,000 feet higher. In the Marañon region, as at Moyobamba, Tarapoto, Aipena, and San Regis, and also in the Urubamba Valley (Upper Ucayali), it grows luxuriantly but will not give crystallized sugar; so it is turned into aguardiente. There the grain ripens in six or seven months after planting. Considerable sugar of excellent quality is manufactured at Abancay on the Apurimac, but rudely purified with clay; it is mainly consumed in Cuzco, where it brings forty cents a pound.

But the Pacific slope of Peru, particularly of northern Peru, is the great sugar district; there it is fast taking the place of cotton and rice. The whole coast presents a series of arid wastes and fruitful valleys—alternating Saharas and Eden's. Nothing is wanting but water to convert the entire coast into a garden twelve hundred miles long. But it is worthy of remark that wherever the railroads run from the coast into the mountains, they seem to have changed the meteorological character of the lowlands, rains being more frequent on the coast terminus than formerly.

Every port above Callao exports sugar, those of Talaverry and Eten taking the lead. All told, there are about one hundred and twenty large sugar estates on the coast. Lambageque and Chiclayo contain eighteen, of which that of 'Pátapo" is the chief and probably the largest in the country. It guarantees $5,000 a month freight to the railroad. The Pacosmayo Valley has fifteen, of which the "Lurifico" is the most important, and to which I shall recur. The rich valley of Chicama near Trujillo is crowded with sugar plantations: its twenty-four mills produce to the value of one million soles per month. The machinery is English. The "Casa Grande" of Sr. Albrecht is the most complete. Further south, near Chimbota, in the Valley of the Santa, are two large establishments, "Puenti" and "Viuzos;" the former has American machinery precisely like that of "Lurifico," only the charcoal process is not used. Choncay, just above Lima, has fifteen estates, of which "Palpa" is the largest, while around the capital are more than twenty, among them the well furnished establishment of "Santa Clara." In the valley of Cañeta are the extensive plantations of the late Henry Swayne, twenty-five hundred acres being under cultivation. There are also numerous cane estates in the departments of Ica and Arequipa, but they yield comparatively little sugar.

The "Lurifico Hacienda" near Pacosmayo being a representative establishment, I will describe it. The estate was once the property of the unfortunate President Balta, afterwards of Henry Meiggs. It now belongs to Mr. Ford of the house of Dreyfus & Co., and is under the superintendence of Mr. Kauffman, from Ohio. Two thousand acres are covered with sugar cane, the rest being given up to rice for the laborers. English steam plows are used in cultivation. The mill works were designed by Cahill and constructed by Morris of Philadelphia. They cost when put up $250,000. The engine is ninety horse power, and the roller weighs twelve tuns. Three small locomotives from Paterson, N. J., bring in the cane from the field and discharge it upon a "conductor" seven feet wide and one hundred and fifty feet long. The dried pressed cane, called "bagass," affords all the fuel used for engine and locomotives. There are twelve copper "defecators" or purifiers, each holding four hundred gallons; when full fed, the mill can fill eighty defecators daily. In the defecators, the juice, "guarapa," is treated with lime and heated by steam to 140° to remove acid and scum. Thence the liquor goes to two of the twenty filters filled with animal charcoal, and next into large iron tanks, whence it is transferred to three copper "vacuum pans" in succession, No. 1 having a vacuum of six inches, No. 2 of thirteen inches, No. 3 of twenty-two inches. In these it is boiled by the exhaust steam. When it leaves the third pan, it has a density of 27°, and is called "syrup." Carried to the clarifiers, where it is treated with steam to remove more scum, it passes next into the rest of the charcoal filters, and then into two other iron tanks from which it is drawn into a fourth copper exhaust pan, called "strike pan," with a vacuum of twenty-five, where it is boiled for one hour till it becomes a thick syrup. Then by letting in a small portion of thinner syrup, it grains, and by continuing this, the size of the grain increases. From the strike pan it goes into the "coolers," which are pans five by six feet on rollers. When cold, it is transferred to the "mixer," where it is stirred by machinery so that it will run into the "centrifugals," which make 1,200 revolutions a minute, to be deprived of its molasses. The coarse grained sugar thus made is called "muscabado" or "granulado" No. 1, and is exported in bags. The grains are apparently cubes, but are really monoclinic prisms. The molasses is taken to the "blow-up," where it is subjected to jets of steam, skimmed and taken to the strike pan, and made into sugar No. 2. The refuse molasses and guarapa are taken to the distillery and put into large vats for fermentation, thirteen all told, ten feet deep and ten feet in diameter; thence to the still, rectifiers, and condenser. Every day 1,400 gallons of rum of 40° are made.

The Lurifico works are capable of turning out per day 35,000 gallons of juice, requiring one hundred and seventy-five tuns of cane, or nearly 50,000 lbs. of muscabado. The length of the process from pressing the cane to bagging the sugar is two days, including one for cooling. In the field and mill there are 939 Chinamen, who get two rations of rice per day, one sol a week, and two suits of clothes a year. They all live within a small enclosure called "Galpón," adjoining which is an excellent hospital under the charge of Dr. Heath. They work ten hours a day—five hours before breakfast and five hours in the afternoon. On Sunday, which is pay day, they work but four hours. In less than four years the majority will be free, as their term of servitude will expire: some will re-contract for a year or two at higher wages, but many will set up for themselves, for the great ambition of the more intelligent Chinamen is to keep a shop or fonda. The labor question is therefore constantly revived, and is the uppermost topic at the sugar haciendas of Peru.

THE EMIGRATION OF AMERICAN MECHANICS TO ENGLAND.

During the past three months some three hundred and twenty-five mechanics have emigrated from this country to England under contract with English employers. In England, for some time past, building trade strikes have been the rule, and at present these are in progress in London, Manchester, and seven other large cities and towns. It is to avoid the effects of these strikes that employers seek to import American workmen, so that, in brief, the case is precisely the same as if railroad corporations here, during the late uprising, had imported English navvys and train hands to fill the places of their former employees.

Now we need not point out that this is a bad status for any workman in a strange country at the outset. Necessarily he becomes at once an object of aversion to the leagued members of his trade, and this is none the less intense because he is a foreigner. He will find, however unjustly, Yankee cheap labor in England placed beside Chinese cheap labor here—the difference recognized only in kind. Law and justice, it is true, are on his side, but the difficulties of his position will not be modified thereby. While his contract holds he may continue on, but at its close, or if he emigrates under no contract, then he comes into competition with the great mass of working men, and enters into a condition far worse than that which he left his own country to escape. The United States Consul at Liverpool has issued a public warning against the current report that fewer men are out of employment in England than in the United States. He says that many American mechanics are now in suffering and in destitution abroad; that able-bodied working men are constantly calling at the Consulate for relief which cannot be accorded, and he positively asserts that neither skilled nor unskilled working men from abroad can find employment in England. The English journals themselves express surprise at the emigration, and call it "a complete reversal of the ordinary course of things." As for any relief from labor troubles being gained, the *Engineer* reviews the present strikes in progress and sees no likelihood of any such result. On the contrary, it says that "facts do not predicate peaceful times for the emigrants." Our working men will find, moreover, that the English practice of their trades is not their practice; that English habits of life are not their habits; that, in short, they have got to begin and learn much that is new and strange before they stand on an even footing with their English tradefellows. And they will further find that if, after their contract time has expired, they return home, their years of labor abroad have not brought them nearer to independence, but that there are still new associations to be formed and a new start to be made. It is better to stay at home, better to be first sure that every channel of honest work in this country is exhausted, better to learn to live on reduced wages until the better times which must eventually arrive are at hand, for when they do come they will as certainly bring their rewards for those who

"Learn to labor and to *wait*."

PROGRESS OF THE SCIENTIFIC AMERICAN.

Probably there is no weekly periodical in the world whose separate issues are scanned by so many readers as the SCIENTIFIC AMERICAN. In the hundreds of libraries and reading-rooms where it is filed, no journal is in greater demand or more constantly consulted. In many villages each copy of our paper goes through a regular round of circulation and reading from one neighbor's house to another; and not unfrequently from a company of readers in one country to others in another country. For example: a Brazilian subscriber writes us that he receives his SCIENTIFIC AMERICAN in that country through a club; after himself and friends have enjoyed its reading, he forwards it to his brother in England; to be by him, after perusal, sent on to another brother in New Zealand.

In this way the effective influence of the SCIENTIFIC AMERICAN becomes very widespread and enormous; a fact to which our advertisers can testify by practical experience. No other paper brings them so many orders or such intelligent, excellent customers. We estimate the total number of our weekly readers at not far from half a million. The secret of this is that each number of the SCIENTIFIC AMERICAN contains valuable information, which is fresh and useful irrespective of the date of the sheet; and it travels through the world until it is worn out, furnishing entertainment and benefit to every reader into whose hands it falls.

INCREASING THE FLOW OF SPRINGS.

It is a well known fact that rain water and the water produced by melting snow on high land, sinks into the soil until an impermeable stratum is reached. Then it follows that stratum as the same tends downward, thus producing subterranean rivers or brooks. When a well is dug this underground water is sought for; but when the water itself comes to the surface, then the source is commonly known as a spring. In both cases, however, the water flows along a slope higher of course at the point of departure than at the point where the water is obtained. But during its journey obstacles are often encountered which check the flow, so that sometimes a well can be pumped out much faster than it will fill. Hence, after every drain upon its resources, it is necessary to wait a considerable period in order to allow the scanty influx to replace the amount of water removed. Such wells frequently dry up altogether during the present season of the year.

There is a simple way of increasing the flow of wells, devised some years ago by M. Donet, of Lyons, France. Ordinarily the mouths of wells are left open: hence all along the water, from well to original source, there is an equilibrium of air pressure. M. Donet's plan is simply to close the well and pump out some of the air. This creates an excess of pressure to drive water into the well; the supply is thus increased temporarily, and at the same time the underground channels through which the water passes are enlarged by the stronger stream, and so the supply also becomes permanently augmented.

In the case of a spring, however, one of the principal advantages is that the water lifts or ought to lift itself to the level of the soil, and consequently, when a pump is needed, then the source is no better than any ordinary well. There is a way, however, of increasing the flow of springs by the aid of a simple siphon, which has been devised by M. Chefdebien. At the point where the spring emerges make an airtight tank, having a close cover, into which insert a pipe. Bend this pipe over and carry it along for a few hundred feet or so, until by following the downward trend of the land, the end reaches a level, say six feet lower than that of the spring level. Now, apply a pump and draw water through this tube. It thus becomes a siphon (the pump is is at once removed), and the water continues to flow under the influence of a portion of the atmospheric pressure equivalent to the difference of level existing between the spring and the lowest end of the tube.

M. Chefdebien has tried this plan on a spring which took 24 hours ordinarily to fill a hollow place in the rock containing about 200 quarts. From the spring he led a piece of lead pipe four inches in diameter over a distance of 192 feet, so that he obtained a difference of level of nearly 8 feet A watertight and airtight vessel was also built on the spring basin, so as to surround the natural escape orifice. This was six years ago. During that time the water has run constantly; and instead of yielding 200 quarts per 24 hours, it has given 3,800 quarts steadily per same period. That is, the flow has, by the above simple expedient, been increased nineteen times.

Scientific Chess.

The *Boston Daily Globe*, in commenting upon the Chess Record in the SCIENTIFIC AMERICAN SUPPLEMENT, says: "We unhesitatingly give it as our opinion that there is no other Chess Department in any paper on the earth, under the earth, or in the heavens above the earth, that "can hold a candle to it." All those who miss seeing this department of Loyd's will miss a golden treasure."

Coming from any other source we might be inclined to regard such encomiums as mere flattery. But the *Globe* is a wide-awake newspaper, and its chess editor is one of the ablest writers in this sphere. If he does not know wheat from chaff, no one does.

Carrier Pigeons for the English Herring Fishing.

Messrs. Moir and Son have a number of pigeons pretty regularly employed for the purpose of bringing early intelligence of the results of the herring fishery, and the experiment has been very successful. One of the birds, says the *Aberdeen Free Press*, is taken out in each boat in the afternoon, and after the nets have been hauled on the following morning and the extent of the catch ascertained, the pigeon is despatched with a small piece of parchment tied round its neck, containing information as to the number of crans on board, the position of the boat, the direction of the wind, and the prospects of the return journey, etc. If there is no wind to take the boat back, or if it is blowing in an unfavorable direction, a request is made for a tug; and from the particulars given as to the bearings of the craft, she can be picked up easily by the steamer. The other advantages of the system are that, when the curers are apprised of the quantity of herrings they may expect, they can make preparations for expediting the delivering and curing of the fish. —*Land and Water.*

SIZING FOR SIGN WORK.—One of the best mordants or sizing for sign work is made by exposing boiled linseed oil to a strong heat in a pan; when it begins to smoke, set fire to the oil, allow it to burn a moment, and then suddenly extinguish it by covering the pan. When cold it will be ready for use, but will require thinning with a little turpentine.

REMEDY FOR POISON IVY.—E. A. Blood, of Bloomington, Ill., says that bran poultice is an infallible cure for poison ivy.

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IMPROVED FARM LOCOMOTIVES AND STEAM ROAD ROLLERS.

Messrs. Aveling & Porter's well known road and farm locomotives and their steam road rollers have had a new duty and are now adapted for use in connection with the Blake Crusher Company, of New Haven, to their stone and ore crusher. The crusher is mounted on strong wheels, as illustrated, and, by the aid of the Aveling locomotive or their steam roller, can easily be removed from quarry to quarry or to any place where it may be found more convenient or cheaper to take the crusher to the material than to move the material to the stationary crusher. As either of the engines can likewise be used for hauling or consolidating the broken stone, or driving the crusher, the convenience and economy of this arrangement will be manifest.

Messrs. Aveling & Porter, we are informed, have built upward of 1,300 road and farm locomotives; and their extensive manufactory at Rochester, England, has, during the last two years, been doubled in capacity. By reason of the varied duties to which the Aveling traction engine can be applied, including hauling, plowing up prairie land, thrashing, and general farm work, the demand has very greatly increased, and from six to eight engines leave Messrs. Aveling & Porter's works every week throughout the year.

The road locomotive is largely employed instead of the ordinary portable engine for farm and other work; it is extensively used in Great Britain for plowing and hauling farm produce, and heavy material on ordinary roads, and its reliability and great economy, when taking the place of animals for such work, have built up for the manufacturers a prosperous and growing business in England.

The engines are built of great strength and comparative lightness. Their ability to ascend steep grades with heavy loads, their handiness, security against damage when traveling even on rough roads, are leading results obtained.

As an illustration of the value of these locomotives for hauling purposes, the following estimate of the daily expense, we are informed, may be taken as approximately correct, altering cost of labor and fuel for different localities:

Size of engine, say, 16 horse power; journey 12 miles out, loaded, returning empty; grade of road varying, say, from 1 in 25 to 1 in 10; load (without wagons) 12 tons.

Wages, engineer, $2.50; assistant, with wagons, $1.75; coal, half a ton, $2.50; oil and waste, $0.50; interest and wear and tear, say 15 per cent, $2; water, say, $1.25. $10.50, total cost of hauling 12 tons of material 12 miles, or about 7 cents per ton per mile.

One man only is required for the entire management of the engine, and the total cost of running one of these locomotives, of sufficient size to haul and drive the largest thrashers, does not exceed $4.50 per day, including wages, fuel, and oil. Such an engine would easily convey loads of 10 tons of material on ordinary roads and ordinary grades.

The steam road roller of Messrs. Aveling & Porter costs about the same sum for running expenses, and the results of constructing and maintaining roadways, by the aid of this machine, are, it is claimed, that a saving of from 50 to 65 per cent in material and wear and tear is effected.

At the Philadelphia Exhibition, in 1876, the only prize awarded for steam road rollers was given to Messrs. Aveling & Porter. Both during and after the Exposition the locomotives were employed by the British and Canadian Commissioners in removing from place to place large quantities of heavy machinery and material.

Mr. W. C. Oastler, 43 Exchange Place, New York city, is Messrs. Aveling & Porter's representative in America.

MOTE FROM THE EYE.—Take a horsehair and double it, leaving a loop. If the mote can be seen, lay the loop over it, close the eye, and the mote will come out as the hair is withdrawn. If it cannot be seen, raise the lid of the eye as far as possible, and place the loop in it as far as you can, close the eye and roll the ball a few times, then draw out the hair. The substance which caused so much pain will be sure to come with it.

[*Continued from first page.*]

on the ribs, A, and held in place by the spring hooks, F, Fig. 2. It will be seen that, as the uncompressed bale lies upon the blocks, B, it may be moved about without

Fig. 2

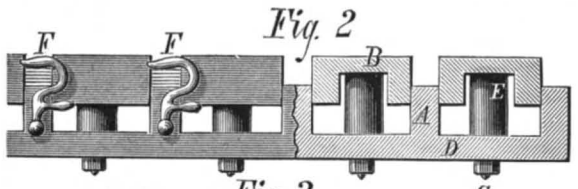


Fig. 3

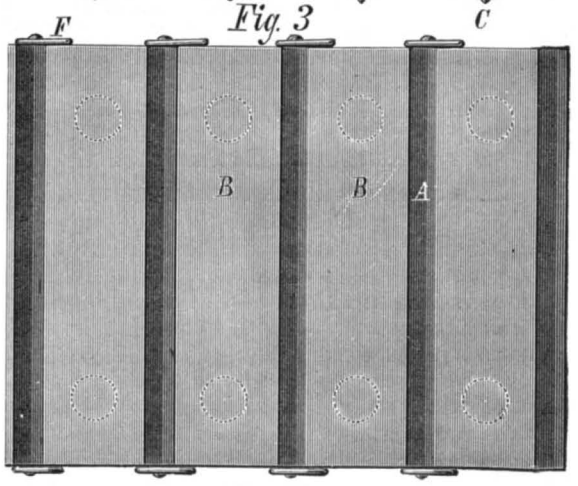
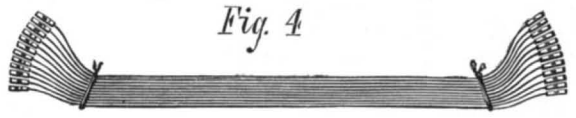


Fig. 4

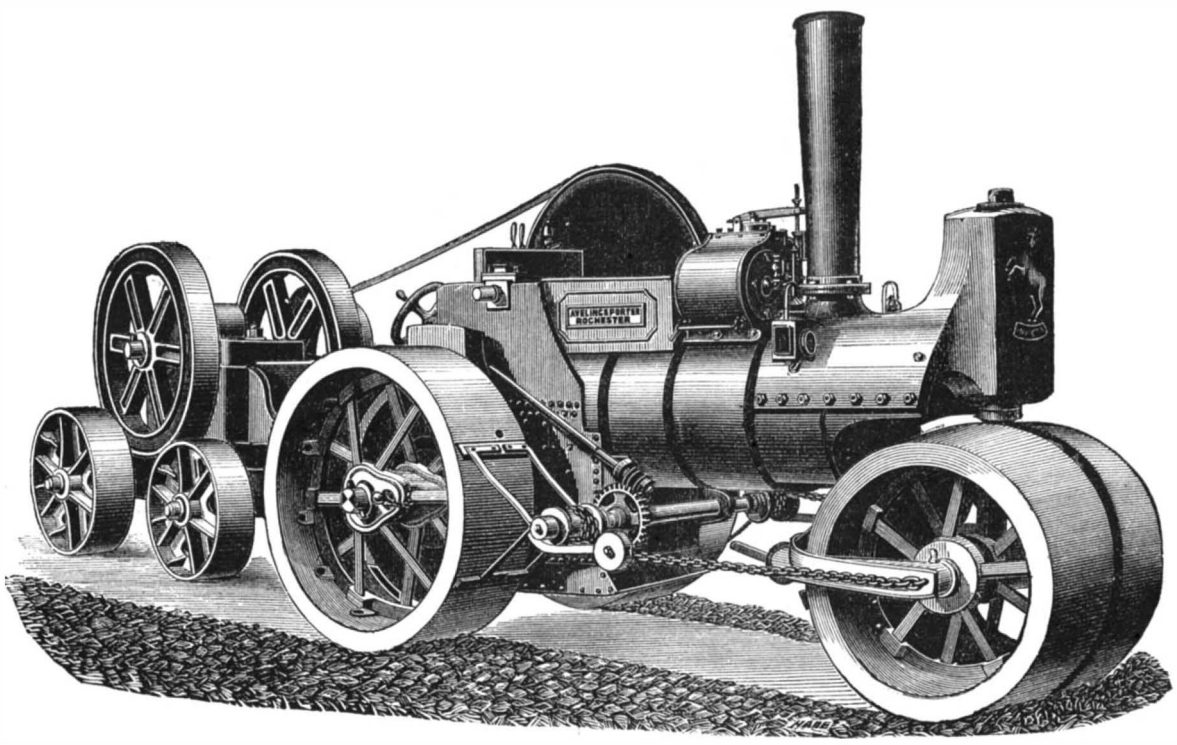


disturbing the band which lies between them. The operation of the machine is as follows: A bundle of the bands, as shown in Fig. 4, is placed on each of the ribs and between the movable blocks, which prevent them from moving laterally. They are held on to the face of the ribs by the hooks, F. A bale of cotton is now put into the press, where it is supported by the movable blocks.

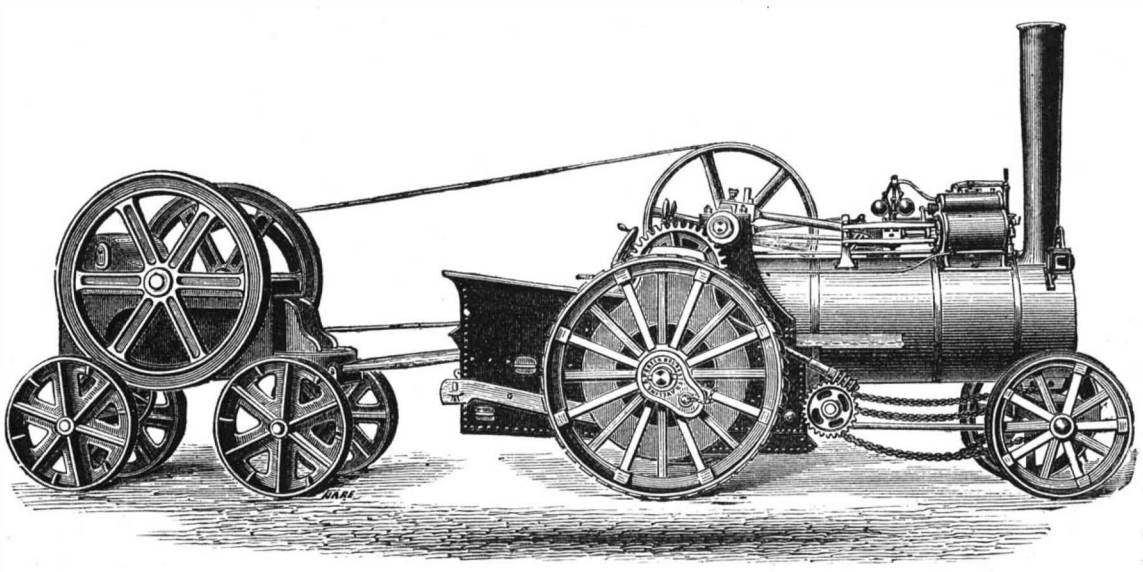
After the bale is adjusted to the required position (the movable blocks holding it up and preventing any disturbance of the bands), the press moves up until it is fully compressed. As soon as the pressure is applied the movable blocks yield until they rest on the plate, D, leaving the bands not only in contact with the bale, but, in the case of full bundles, forced into the cotton from an inch to an inch and a half.

The bands are now fastened, the press lowered, the bale removed, and the operation is repeated. The supply of bands is renewed from time to time as they become exhausted. We are informed that 30 bands has been found not to be too many to put in each bundle. Thus the time consumed in reefing or passing the single band through the press is saved. This results in a marked increase of the amount of work done by the press.

Again, the absolute contact obtained by this method renders impossible poor or shiftless work by a careless tier. These platens are in successful use on the presses of the Union Cotton Compress Association of Memphis. Patents were issued to John T. Burr, dated September 15, 1874, and January 23, 1877, through the Scientific American Patent Agency. Further information may be had by address A. E. & J. T. Burr, either Memphis or Nashville, Tenn.



AVELING & PORTER'S STEAM ROAD ROLLER AND BLAKE'S CRUSHER.



AVELING & PORTER'S ROAD & FARM LOCOMOTIVE AND BLAKE'S CRUSHER.

The Coming Great Famine in Madras.

A calamity greater, says the *Saturday Review*, than any that has yet occurred in India during British rule, is now threatening the Presidency of Madras. The famine of this year, which the Government is at present fighting to the extent of its resources, is to be succeeded by another due to the failure of the rains of the Southwest Monsoon, which will continue over another year and which will inflict with double rigor a people already weakened by past suffering. It is reported that even during the present famine more people have been found dead in Madras in one morning than died during the whole of the Bengal famine, and it is asserted that more than half a million of inhabitants have already succumbed.

The difficulties of the situation are increased by the lack of means of inter-communication. There are very few railways, and most of the grain is taken into the interior by bullock carts. But there is no food for the animals any more than there is for man, so that practically there is no way of carrying relief into the distressed districts.

It will be seen that in this case eight portable and cheap field railways will be of great utility. There is no fear of scarcity of grain provided money be obtained to buy it and means of transportation suitable for the purpose be at hand. The funds are already being raised by appeals to the charitable in England, and to inventors and manufacturers the world looks for the necessary railways or other modes of carriage. It has been proposed that men be used for traction purposes on these roads instead of bullocks, six men being estimated equal to one brute. It is hardly necessary to add that the cheapness of the system proposed will be an important consideration, as the routes will probably be both long and numerous.

Dipping Acid for Brass.

A dipping acid for brass is made by mixing together nitric acid, sulphuric acid, and muriate of ammonia, or sal ammoniac. There is no certain rule by which to mix the acids. The bath is composed mostly of nitric acid, the sulphuric acid and the muriate of ammonia being present in inferior quantities. The mixture must be so strong that a momentary immersion will be sufficient to make the work bright and clear. To remove the acid, wash in hot water; and to dry the work, imbed it in fine hot sawdust. Heating the work before dipping will remove the oil or grease, which must be removed, or the acid will not act effectually or satisfactorily.

THE BEST OILSTONE FOR SMALL DRILLS, ETC.—An Arkansa or Wachitas stone, which can be procured of almost any hardware dealer, is the best for sharpening small cutters and drills. Use plenty of sperm oil on the stone, and keep it enclosed in a tight box or case made to secure it. Clean the surface of the stone occasionally with kerosene.

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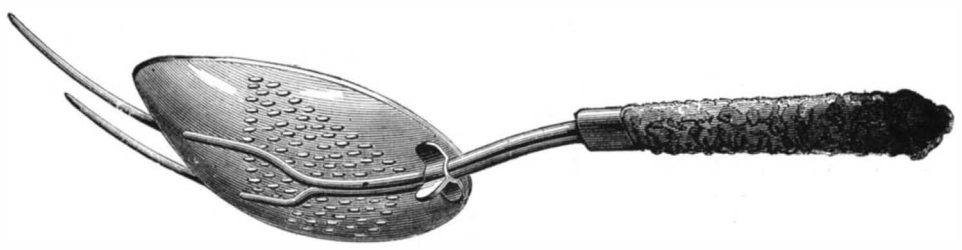
COMBINED SKIMMER AND FORK.

The annexed engraving represents a new instrument designed to be used for cooking purposes, and is so constructed that it may be used as a skimmer and a fork. The two parts are connected in such a manner that they may be slid back and forth upon each other, to adapt the instrument to be used as a skimmer or as a fork, as may be desired.

The skimmer is convexed and perforated with numerous holes, in the usual manner. The fork is made of iron or steel wire, and the prongs and the lower part of the handle are curved upon the same arc as the skimmer. The shank or lower part of the fork passes through and slides in a keeper attached to the back of the skimmer near its rear edge. The prongs of the fork pass through holes in the skimmer near its forward edge. The prongs of the fork are made of such a length that when it is drawn back the points of the prongs may be back at least as far as the forward edge of the skimmer, and when the fork is pushed forward its prongs may project far enough for use as a fork.



FLAGG'S COMBINED SKIMMER AND FORK.

Patented through the Scientific American Patent Agency, February 1, 1876, by Emerson E. Flagg, of Brattleborough, Vt.

IMPROVED HOP CULTIVATOR.

This machine has been constructed for digging hop ground by steam power. In the best cultivated hop gardens it is the custom to dig the whole of the land by hand, in others small two-horse plows are used to plow between the rows of hops, these rows being afterwards dug by hand.

Although originally designed for use in hop grounds, the machine is well adapted for sugar plantations and other agricultural work. It is not hauled by a wire rope as steam plows or cultivators are, but is propelled by its own hind wheels which receive motion by gearing. The framework is of angle iron, and at the after end carries a three-throw crank shaft; on this crank shaft is keyed a bevel wheel which gears with a pinion on a vertical shaft; this vertical shaft carries a V pulley which receives motion from the engine by a hempen rope. In front of the V pulley are the guide pulleys, so arranged as to allow the implement to turn round without interfering with the position of the rope on the driving pulley.

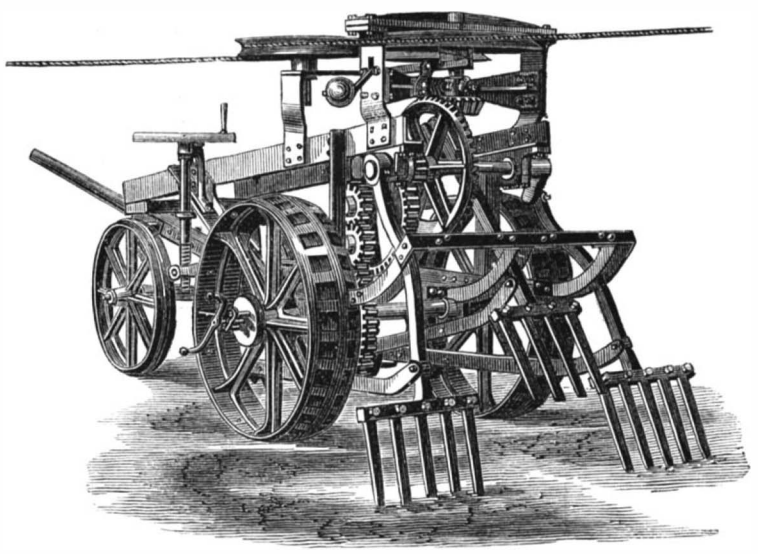
The cranks work three vertical connecting rods, which are in the form of the letter T inverted; in the lower parts are fitted the tines; a radius rod is jointed to each connecting rod a short distance above this crosspiece which carries the tines; this radius rod acting as a fulcrum causes the extremities of the tines to describe an oval; as the crank shaft revolves (in a contrary direction to the road wheels) the tines enter the ground nearly vertically; as the crank passes the lower center the tines are pushed backwards, tear the earth up, and turn it over. A train of wheels transmit motion to the road axle, on which the driving wheels run loose, but are thrown into gear by clutches worked by screws, which are tapped into the axle. The machine is steered by the leading wheels.

In setting to work, the hemp rope, which is driven from a V groove in the flywheel of a portable engine, is led round the field on pulleys and porters, and takes a turn round the driving pulley on the machine, as shown in the engraving, which we copy from *Engineering*. When the digger has made a journey up the field and arrives at the headland, the tines are lifted by the hand wheel, which depresses one arm of the bell crank; on the other end of this bell crank the forward ends of the radius rods are hung, and as it is forced back the tines are lifted out of the ground; the land-side wheel is then released by withdrawing the clutch, the inner or land-side wheel remaining stationary.

The machine and tackle are worked by three men and a boy, namely, engine driver, a man to attend to the machine, a boy to steer, and one man to move, at each bout, the anchors, which are ordinary farm wagons with pulleys fixed to them.

With an eight horse power portable or traction engine five acres can be dug per day at a depth of 9 inches.

These machines are constructed by Messrs. J. and F. Howard, of Bedford, England, from the design of Mr. J. H. Knight, of Farnham.



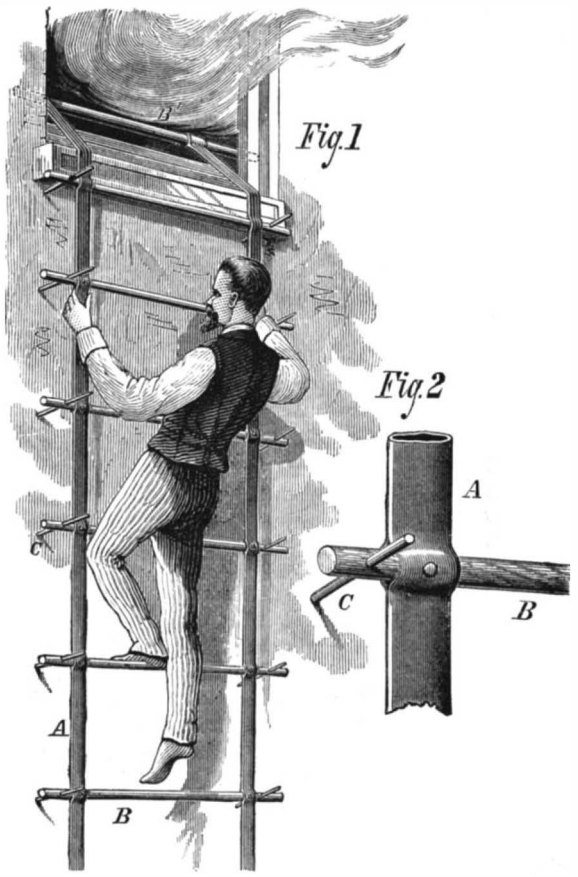
KNIGHT'S HOP CULTIVATOR.

Testing the Gas of New York City.

Arrangements have lately been made to test the gas furnished by the several companies to New York city. The pure sperm candle, burning 120 grains per hour, is used as the standard. The principal instrument used in the tests is called a photometer, and is placed in a room, the walls and ceiling of which are painted black. The instrument consists of a 60 inch graduated bar, connecting with two sperm candles on one side, and with the gas-measuring and burning appliances on the other, comprising an ordinary wet meter, a pressure gauge, and a governor. Upon the bar is a sliding box, containing what is called a Letheby disk, which is placed vertically to catch the light from both sides. All light is then excluded from the room. By experimenting with the disk the examiner learns, by the position of the box upon the graduated bar when the light falls with equal strength on both sides of the disk, whether the illuminating power of the gas reaches the required standard, that of 16 candles. The gas must be used at the rate of five cubic feet per hour, and the meter shows the rate at which the gas is burning.

ALLEN'S IMPROVED FIRE ESCAPE.

The accompanying engravings represent a new flexible or folding ladder, designed as a means of enabling persons



to escape from the upper stories of burning buildings. The side supports, A, Fig. 2, of the ladder are made of webbing woven tubular or of double thickness, with openings transversely through it at proper intervals to receive the rounds, B. The latter have studs or arms of wood, C, fixed into their ends for the purpose of holding the ladder away from the wall, and thus insuring a good foothold to the person descending. The top round, B', is made larger than the others, so that it may extend across the window inside and thus securely sustain the ladder. It is intended that the ladder shall be kept rolled up beside the window, so that in case of fire it may at once be thrown out, when it will uncoil and be ready for use, as shown in Fig. 1. The inventor states that two or three persons may descend at once, and that the ladder constructed as above explained is capable of sustaining a weight of 1,000 lbs.

Patented through the Scientific American Patent Agency, June 26, 1877. For further information address the inventor, Mr. Isaac H. Allen, Black Creek P.O., Welland county, Ontario, Canada.

Professor S. P. Langley's New Method in Solar Spectrum Analysis.

No observation of modern physical astronomy is more striking in its conception than that which attempts to determine the motion of a celestial body by the altered wave-length of its light, and none has attracted more general attention. It is popularly understood that the proper motion of certain stars in the line of sight has been thus completely demonstrated, but those particularly engaged in such studies know how far astronomers have till very lately been from the certainty attributed to them.

It can hardly, however, be deemed superfluous to still offer, upon so important a question, the results of an independent method of measurement, and one which renders errors from instrumental displacement, on the danger of which so much stress has been deservedly laid, in the sense in which the word is here used, not only unlikely but impossible.

The theory of the proposed method is very simple. Let two spectra be formed side by side, the one of light from one edge of the sun, the other of light from a point 180° distant. The instrument being in adjustment, if these points be in the neighborhood of the solar poles which are relatively at rest, all the lines will be continuous in both spectra. But if the instrument is rotated till the light comes from points on the eastern and western sides of the sun, which are in relative motion, not only will the solar lines be discontinuous, in the two spectra: as though the one receiving light from the advancing or eastern side had been slid past its neighbor toward the violet: but any mal-adjustments of the instrument, which simulate this effect, can be with certainty be detected by a means to be shortly described. The solar spectrum consists of two distinct kinds of lines, one caused by absorption in the solar, the other by absorption in the terrestrial atmosphere. These latter being formed by light from all parts of the sun are independent of its rotation.

The prisms are adjusted, till, on looking on the sun directly, the lines are all continuous in both spectra, then the instrument is put in the telescope and the slit placed at such a position-angle that the light in spectrum A comes from the vicinity of the north solar pole, that in spectrum B from the south. On looking in, we see a very long and narrow spectrum, filled with dark lines and exhibiting the chromospheric lines on both sides. It is divided by what appears to be a very fine dust line, in two exactly corresponding parts, and is in reality two distinct spectra, as we see by the opposed chromosphere lines; but as the sources of light for both spectra are relatively at rest, all the dark lines are still continuous. But now (without disturbing any adjustment), revolve the whole 90° about the optical axis passing through the center of the solar image, so that spectrum A is formed by light from the eastern or advancing edge of the sun; spectrum B by light from the western or retreating one. A curious change has taken place. By a very minute but perceptible quantity, spectrum A appears to have been slid past its neighbor, toward the violet end, so that every solar line in the first is "notched" at its junction with the second; while, at the same time, the telluric lines are as unaltered as the fixed lines of a micrometer web would be, by moving a scale about in the field. The effect is the same as though the spectra were tangible things, like two engine-divided scales, whose numerous delicate divisions (represented by the solar lines), were all in exact juxtaposition a moment before, and are all now just perceptibly displaced, as when a vernier plate is moved till a coinci dence is made at a new stroke on the limb.

Moving the instrument 90° more, we come again into the axial line of the sun, and the coincidence should return; with still 90° more we are again in the equator, but now spectrum A is formed by light from the western edge, and this time it is moved the other way, as if it were a scale which had been slid by a very slight but distinctly perceptible amount toward the *red* end; while still the telluric lines retain their continuity, assuring us that no mal-adjustment has occurred.

It will be admitted that this change is, if real, excellent experimental evidence that the wave length is virtually different in light from the eastern and western limbs, as theory predicts. For, granting that the instrument is mal-adjusted in any unknown way or degree, any *instrumental* cause will affect solar and telluric lines alike, and we may in fact defy ingenuity to suggest an error of adjustment, which will modify one and not the other.

It will be remembered that many lines in the spectrum are only seen when the sun is low. These are clearly due to the absorption in our atmosphere. Many thousands, as we know, are due to absorption in the sun's atmosphere. There remains a large number of lines not coincident with any we

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produce at the electrodes of our battery, and always present in the spectrum. Of these we do know that they are either caused by the sun's atmosphere or ours, without always knowing which, for these can only be inferred to be telluric from their growing stronger as the sun sets, and this, though easily determined in the case of a single line, becomes a task of great labor where we deal with thousands. It is evident, however, that after having used known telluric lines to determine the fact that the refrangibility of solar lines only is altered, we can reverse the process, and classify unhesitatingly hereafter all lines as telluric which are unaffected by the changes that compel others to betray their solar origin. To merely see these two spectra with clearness, then, is to be enabled to pick out the telluric lines from the others, as though they were mapped before us. They are mapped in fact, and it becomes, under the proper conditions, a matter of simple inspection to determine them.—*American Journal of Science and Arts.*

Communications.

Our Washington Correspondence.

To the Editor of the Scientific American:

During the last session of Congress, acts were passed authorizing the Commissioner of Patents to extend two patents, if in his judgment the applicants were entitled to it. One of these cases, that of E. T. Bussell, for a combined rubber and steel car springs, patented Nov. 29, 1853, and extended in 1867, has just been refused; the other, the Voelter wood-pulping apparatus, has not, I believe, been yet decided.

The commission to try Mr. McClary Perkins met last Monday, but the authorities having the matter in charge refuse at present to have anything to say about the proceedings, preferring to have the matter kept secret until the decision of the commission is announced.

The scientists of this city have been considerably excited over the discovery of two satellites of Mars by Professor Asaph Hall, of the Naval Observatory, with the aid of the new 26 inch refractor. It appears that the Professor really saw one of the satellites on the 11th. ult., but had no opportunity then to wait for the planet's motions, and therefore failed to recognize it as a satellite. He, however, saw on the 16th. ult., at 11 h. 42 m., a faint star near the planet, so faint that the latter had to be thrown out of the field of view in order that the former might be seen. It was nothing remarkable to find a star there, however, as there are many in the region where Mars may now be seen, but this one appeared to be following the planet, which led the Professor to particularly notice it and to carefully measure the distance between them about one o'clock. At two o'clock he made another measurement and found that the two stars kept the same distance from each other. He then stopped observations for the night; but on the next morning mentioned his observations to Professor Newcomb, who concluded that it must be an asteroid or else a satellite of Mars which has hitherto escaped notice. As it was known there was an asteroid in that neighborhood the two astronomers waited with some anxiety for the reappearance of the object, but Professor Newcomb was so well satisfied that it must be a satellite that he set to work to calculate its time of revolution, which he found to be about thirty hours. The planet could not well be seen until near ten o'clock on the night of the 17th., and this time of revolution showed that the satellite, if it was one, could not probably be seen until nearly the morning of the 18th., but if it was an asteroid it could be seen on the night of the 17th. As soon as the planet could be seen the professors were on the watch, and to their dismay they found a star just where the asteroid should be; but Professor Hall became satisfied from his measurements that it could not be an asteroid, and Professor Newcomb, seeing Mars apparently passing the object, from his calculations thought that it would surely be seen at four o'clock on the morning of the 18th. at the same place where it was discovered on the 16th. They accordingly waited, and were gratified with the sight of the star in the exact place predicted by Professor Newcomb. From this they were perfectly satisfied that the object of their observations was a satellite of Mars, and to their inexpressible gratification they shortly after discovered a second satellite. At the end of the thirty hour period, the evening of the 18th., their observations were confirmed by the reappearance of the satellite; and Mr. Todd, another of the astronomers, thought he discovered a third object, which may yet prove to be still another satellite. The following extract from the official report of Rear-Admiral Rodgers, in charge of the observatory, gives all the data relative to the position, time of revolution, etc., that has been obtained at the time of this writing:

"The first satellite has an apparent distance from the center of Mars of 82 sec., and its time of revolution around the planet is 30 h. Its magnitude Professor Hall estimates as the 13th or 14th. The plane of its orbit has now a considerable inclination to the line of sight from the earth to Mars. At its elongations its angles of position are 72° and 252°. The second satellite was discovered August 17th at 16 h. It appears to be quite as bright as the first one, and at the elongations has nearly the same angles of position, which correspond to the equator of Mars. Its apparent distance at the elongations and its periodic time are not yet known. The following are the preliminary elements of the outer satellite as calculated by Professor Simon Newcomb: Major axis of orbit, 82 m.; angle of major axis, 70° and 250°; minor axis, 28 m.; passage of satellite through western axis, August 14, 16 h., 40 m.; the period of the inner satellite or satellites is so short, probably less than eight hours, that it cannot be fixed."

The cotton report for August, of the Department of Agriculture, makes a good showing, but a slight decline is observable over the condition as reported for the previous month, which was $93\frac{4}{10}$, the average for this month being 93. In Louisiana the promise is extraordinary. In Concordia parish the best crop since 1870 is expected; and in Union parish, "the best since 1860." In some of the Atlantic coast counties there is frequent mention of inferior fruiting; and in the Carolinas generally there has been too much succulence from too abundant moisture. In Georgia and Alabama, on the contrary, there has been injury from drought, but of late the weather has been more favorable. In some of the Mississippi bottom lands, some of the cotton has been abandoned on account of too much wet weather. Considerable complaint of the caterpillar is heard from some ports of Texas, but they do not appear to have affected the crop seriously, except in a few cases. The caterpillar has also appeared in a few places in Louisiana, Alabama, Florida, and Georgia.

The Secretary of State has received a dispatch from our Minister to Greece, in which it is asserted that the United States can now and henceforth will control to a large extent the grain markets of Europe. Russia has been our only competitor in this trade; but under the most favorable circumstances for that power the United States has had the advantage of that great cereal-producing country, as our machinery, railroad system, elevators, and simple customs regulations combined have enabled us to place our grain on shipboard at about 15 per cent less cost than the Russian shippers can handle theirs. The war in which Russia is now engaged will certainly not lessen these advantages, and with such an outlook it does not seem too much to assert that with reasonable efforts we shall control the English and some of the principal continental markets. In anticipation of this, British capitalists are now engaged in building six of the largest sized iron vessels designed expressly for the conveyance of grain on English account; and it is suggested that we should not only strain every nerve to meet the increased demand for our breadstuffs, but that we should supply ships also. It is further suggested that, if we wish to retain this trade for all time, some cheaper means of transportation than railways will be found necessary, and that if we had one or two more canals like the Erie, or if the capacity of that could be increased sufficiently, it would seem likely that we could readily retain this trade in our hands until such times as our population became so great as to readily use all our grain at home.

The river and harbor appropriation bill of 1876 appropriated $100,000 for the improvement of the mouth of the Mississippi river, but "provided that the appropriation shall not be available whenever and so long as there shall be an open channel of eighteen feet of water at mean tide to and from the sea at the South Pass." Captain Brown, the engineer in charge, has reported to the Secretary of War that a survey has been made, showing a channel 250 feet wide and 18 feet deep, and the Secretary has ordered that further expenditure of the $100,000 be stopped. The dredges that are working on the other passes will therefore be withwithdrawn. This is construed as an official acknowledgment of the success of Captain Eads' jetty system, and it must be very gratifying to him, in view of the official opposition he had to encounter before he could get his plans adopted.

Reports just received here state that the Entomological Commissioners have made an extended trip through a large region of our western territories. The observations of Professors Riley and Packard coincide in indicating that little trouble need be feared from the grasshoppers during the present year in the west. The wet, cool, backward weather has proved unfavorable for the development of the insects, and there are only a few localities where the numbers hatched are insufficient to do any damage worth mentioning. Professor Riley speaks more doubtfully about Colorado in this respect than as to Missouri, Kansas, and Iowa, on account of the greater diversity of surface and climate that Colorado affords, yet even as to that State he is very hopeful. In Minnesota and Dakota, Mr. Whitman has compiled a report of the observed flights of grasshoppers for the present year. Their directions varied in a puzzling manner, and it is difficult to draw any conclusion from the record as to their destination. Several of the flights were observed to go towards the northeast, which may account for the recent complaints from Canada of a visitation of the 'hopper. A very encouraging circumstances for our farmers is that no account of the swarms which passed over Dakota describe the insects as alighting either to hatch or feed.

Major Powell, in charge of the geological survey of the territories, states that there is but a comparatively small area of arable land now owned by the United States, and is preparing for Congress, at the direction of the Committee on Public Lands, a report to maintain his assertions. The Major's statements, however, are severely criticised by the western papers, who state that he runs an imaginary line through Minnesota, Iowa, and Kansas, separating the "arid" and the "humid" territory, west of which he says that farming cannot be successfully carried on. It is stated that the experience of thousands of settlers contradict his theories, and that even if they were correct at present, there is no doubt that tree planting would redeem the so-called "arid" districts, as it has many other similar localities.

One of the Japanese Postal Commissioners is in this city, and has been taking observations of the working of the General Post Office, with a view to incorporate some of its features with the postal service of Japan. He was afforded every facility for carrying out the object of his visit, and appeared much pleased with what he saw.

Washington, D. C. OCCASIONAL.

The Locusts in Kansas.

To the Editor of the Scientific American:

In answer to many questions now being asked, I would say that, from all that can be ascertained, there is no danger whatever of another general invasion of locusts into Kansas and adjacent States this fall. This has been my opinion all along, and the experience of the past two months strengthens it. The insects that developed in and arose from the country invaded last year flew, as I said they would, in a N. and N. W. direction up to the early part of July; after which their course was more irregular, and finally set in the opposite direction, namely, S. S. E. and S. W.

The country in which they hatched has been evacuated, and serious injury was confined to the extreme N. W. counties of Iowa and to Kandiyohi and some half dozen surrounding counties in Minnesota. With a few rare exceptions, the departing swarms have been light, and have vanished beyond record without doing harm. "What has become of them?" is a common question. They were mostly diseased and parasitized when they rose, and kept dropping in scattered numbers in the country they passed over, to perish without notice and without issue. The more healthy have been lost to sight in the thinly settled regions of the Northwest. Those which rose late in June and early in July from Minnesota, after flying northwestwardly, retraced their course and have lately been flying over Iowa and now over parts of Kansas. They have done no serious injury, nor do I anticipate any. Those which left Minnesota a year ago acted very much the same way; but they were followed by immense hordes from the country N. W. of Minnesota and from British Columbia, for they bred all through that region in 1876. The present year, on the contrary, all the information that I can gather indicates that the insects are not, and have not been, in noticeable numbers in these northwest hatching grounds. Dr. Packard did not find them in Wyoming, Montana, or Dakota, and there are none in Manitoba or in any of the more settled portions of British America. I expect to find the same state of things in the Sascatchawan country. From the mountain regions west of Kansas there is no danger, because the insects now developing in the higher mountain parks and passes are so relentlessly pursued by parasites and other enemies. Hence I say to all who are in the same state of mind: Plant, and leave the locusts out of account. As I have remarked elsewhere: "There is a constant struggle for supremacy between the plant-feeder and its carnivorous enemies. The Rocky Mountain locust got the upper hand during the excessively dry seasons of the early part of the present decade, and has been so numerous for the past three or four years that its enemies have rioted in plenty, and at last, in their turn, have increased inordinately. * * Nature maintains her average in the long run, and a few seasons of drouth and locust ravages are apt to be followed by a period of more rainy seasons and locust decrease." C. V. RILEY.

Glyndon, Minn., August 21, 1877.

Growth of the Human Hair after Death.

Dr. Caldwell, of Iowa, states that in 1862 he was present at the exhumation of a body which had been buried two years before. The coffin had sprung open at the joints, and the hair protruded through the openings. On opening the coffin, the hair of the head was found to measure eighteen inches, the whiskers eight inches, and the hair on the breast five to six inches. The man had been shaved before being buried. In 1847, a similar circumstance occurred in Mercer county, Pa. In digging a grave, the workmen came upon the skeleton of a man that had been buried ten years. The hair was as firm as during life, and had grown to a length of eleven or twelve inches.

Copyrighted.

The Germans attribute sharp tricks to the Yankees, but following is quite as bold a swindle as any of our own. An advertisement has been circulated promising to send for one mark (25 cents) "a beautiful secret, how to become very strong," and signed M. L. Müller, in Erfurt. A person who sent the required amount received a printed slip with the following prescription, enclosed in an unpaid envelope (prepayment is still optional over there): "To become strong! Take a bottle of good red wine, bury the wine in the earth in the neighborhood of an ant-hill, and leave the wine there a whole year. Then dig up the wine again and drink some of it occasionally, and you will receive strength which will increase to your astonishment. M. L. Müller, in Erfurt." The same slip contains the usual copyright expression, "reprints forbidden," or literally "Nachdruck verboten."

"WE find Mount Union College," says Chief Justice Chase, "healthful, national, making integral education attainable by all;" has superior courses, professors, museum, apparatus, board facilities, $500,000 property benefiting its 13,097 students, who earn expenses teaching winters without losing time. For new catalogue, address Pres. Hartshorn, LL.D., Alliance, O.

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PRACTICAL MECHANISM.

BY JOSHUA ROSE.

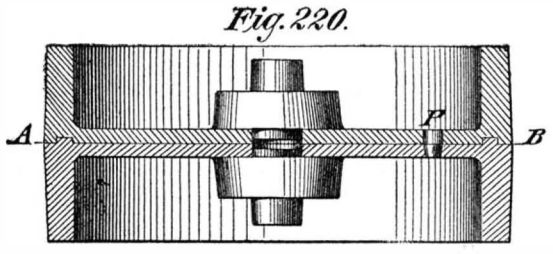
NEW SERIES—No. XXXII.

PATTERN-MAKING.—PULLEYS.

For the sake of durability, patterns for pulleys are generally made of cast iron. For convenience in moulding, it is usual to make them in halves, as shown in Fig. 220, A B being the line of division; the hubs are of wood, as they frequently have to be changed to suit different sizes of shafts.

We may commence by building up a wooden pattern for half of the rim, making it of such a size as to allow for its being turned by the machinist after being cast. Two castings having been taken from this pattern, they are bored and turned to equal dimensions, the proper draught for moulding being given in the process. A slight projection is turned upon one half, fitting into a recess on the other as shown at B. When placed together the two halves form the whole rim. The cast iron arms may be made either the full thickness or in halves. If made the full thickness they will be fixed to one of the half rims. As half the thickness of the arms is made to project beyond the half rim, it will form a guide to keep the two rims central, so that in this case the projection shown at B need not be made. The arms are fitted to the ring by turning, and at the same time a hole is bored through the center to form a guide for the hub, as shown at P in the cut. When the arms are cast in two halves, and a half fitted in each rim, the pattern is easier to mould, as a level parting is secured. The rims must not only be kept central but be prevented from turning one on the other, hence the necessity for the hole to contain a pin, as shown at P. For convenience in drawing the pattern out of the sand, a

Fig. 220.

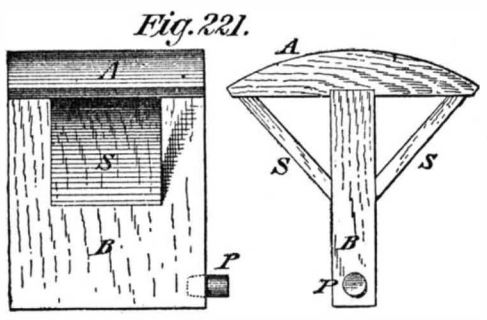


couple of holes may be bored and tapped three eighths or half an inch, or larger if thought necessary, near the rim, diametrically opposite each other.

Occasions often occur when it is inexpedient to go to the expense of a pattern for making a pulley, especially if the pulley be large and only one or two castings required. In this case we may make use of the following contrivance, though it must not be expected that as well shaped castings can be made with it as from a finished pattern.

Fig. 221 illustrates by two views the apparatus as made wholly of wood. A is a piece shaped to the circle of the pulley. It is supposed to be large enough to extend at least about a sixth of its circumference; the depth of A is equal to the width of the rim. B forms a connection between it and the center, where the print, P, is fastened. S S are

Fig. 221.

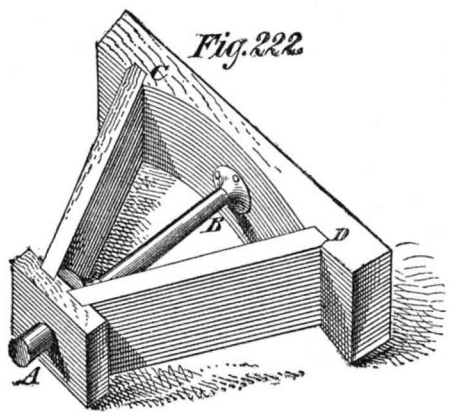


simply braces to stiffen the frame, the use of which will presently be described.

A core box must now be made embracing a section of the interior of the pulley. If the pulley is to have six arms, the core box will take up a sixth of the interior, if four arms, a fourth. We will suppose the pulley is to have six arms. The core is made as shown in Fig. 222. A B represents the arm of the pulley passing through the center of the box; from C to D is exactly a sixth part of the inner circumference of the rim. A sixth part of the hub is fixed in the other corner. The piece, C D, is loose at the joints, as it is necessary to take it off to get out the core. The arm also is loose. When a core is made in this box the arm, A B, is first pulled out; then the piece, C D, is removed, and afterward the other pieces. The hollows around the ends of the arms may easily be formed by the core maker, or they may be formed in the box, as seen in Fig. 222. The hollow or fillet at the end of the arm near the center must be worked out solid with the arm itself, while that which is at the circumference is worked in a piece fixed to C D, the arm being diminished so as to center this piece without making a feather edge. A plain straight arm, oval in section, is the cheapest and most convenient for pulleys made in this way. It may, however, be curved like the arc of a circle, but not made S-formed, as it could not then be drawn out from the solid core.

The moulder, having prepared a level bed, places upon it the frame, Fig. 221, allowing the print to impress itself in the sand; a weight is then placed upon the frame to keep it in position while the sand is piled around the curve and made level at the full height of the same. The frame is then shifted, and the sand moulded in again. This process

Fig. 222.



is repeated until the circle of the pulley is finished. Into the mould so prepared must now be placed six cores made in the box described in Fig. 222, and also the core to make the hole for the shaft. The whole is then covered with a level cope, and prepared for the casting.

Improvement in the Manufacture of Sulphuric Acid.

Professor Post, in his new work *Ueber die Fortschritte der Chemischen Gross-Industrie,* says, in regard to this important manufacture, that there is scarcely any branch of chemical industry where the work has been going on more quietly than here, and to none have so many valuable contributions been made during the past year. In the manufacture of the sulphurous acid, the residues and waste products from various metallurgical operations are coming more and more into use, while the residues left from roasting pyrites are carefully worked over into metal or vitriol, or prepared for other uses as in purifying illuminating gas. Still, in view of the high price of pyrites abroad, many of the technical chemists there anticipate a period when they shall have to return to the use of sulphur. The Platten furnace for roasting pyrites dust is coming into more frequent use, while that of Gerstenhöfer seems to be losing ground. The latter, of course, still holds the field where ores that are apt to sinter or furnace products (like the lead products of Freiberg) are used, as there, in consequence of subsequent concentration, a certain amount of sulphur in the roasted product is required. In the Platten furnace sintering would be very inconvenient. Hasenclever's furnace for blende is exciting more interest, and a new modification of his sliding furnace for pyrites has also been introduced.

It is interesting to notice the practical use of sulphuretted hydrogen gas for the manufacture of sulphurous acid. This gas, which is often formed as a by-product, has hitherto only been a source of annoyance and injury. It is also important economically to observe the employment of compounds of oxygen and nitrogen obtained in the manufacture of aniline.

Probably the most important publication of the year on this subject was the prize essay of Brode on the Glover towers. In this he proves the utility of these towers even for dilute and comparatively cool sulphurous vapors.

The changes in the form of platinum apparatus employed to concentrate the acid are extending. The system of Faure and Kessler (whose apparatus is in use at the Peekskill Chemical Works, and in other places in the United States), has become better known, but the new forms of the old boiler have not been the only subjects of discussion. Post publishes a very interesting original communication upon "Changes in these Apparatus," too long for insertion here. He says: On the whole it seems as if more confidence was reposed in the latter than in that of Faure and Kessler, the introduction of which gave rise to the invention of the latter. Dr. Schott emphasizes the fact that there is the greatest tendency, in all branches of industry where distillation or evaporation is carried on, to lessen the capital invested in apparatus, and also the cost of running it. In the manufacture of spirits, too, the stills are much flattened. It seems as if Faure and Kessler had only intended to lessen the consumption of platinum by leaving off the helmet or head of the alembic, and reducing the platinum covering of the boiler, and in doing this they struck upon the idea of evaporating about four inches of acid in a shallow vessel shaped like a saucer. The helmet was replaced by a tall, broad, and well-cooled cap of lead. The advantages of a shallow stream of acid are noticeable in the larger quantity concentrated, smaller consumption of coal, and greater dilution of the acid distilled over (17° to 18° B.). Still, the necessity of frequent repairs and consequent interruption of the process interferes with its general introduction. Soon after the dis advantages of this apparatus became known, two European dealers in platinum, Desmoutis, Quenessen & Lebrun of Paris, and Johnson, Matthey & Co., of London, each came into the market with a boiler, the form of which showed that the two latter had made good use of the experience of the first-named inventors. To favor a strong evaporation and produce a dilute acid distillate, they retained the same form of kettle, then united with this was a systematic heating of the acid in the kettle, but many disadvantages of Faure and Kessel's dish evaporation were removed by restoring the platinum head.

In 1875, in Prussia alone, 51,881 tons of raw material were consumed in 19 factories, employing 836 workmen, and making 69,985 tons of oil of vitriol, worth $1,359,300. One tenth of the raw material consisted of metallurgical waste products.

Utilization of the burned pyrites is becoming more general in Germany. A number of manufacturers on the Rhine have united together to import pyrites containing copper from Spain, and have the burned product worked up into copper or its salts, in their factory at Duisburg. The burned pyrites of Schœnebeck, which are free from copper, are used to purify coal gas, either alone or after treatment with the manganese solution remaining from the manufacture of chlorine. It is also employed in making green vitriol to neutralize the sulphuric acid formed by the oxidation of the bituminous shales of the brown coal formation, for which iron was formerly employed. The burned pyrites of Schœlmer are regularly employed, mixed with other ores, for making iron.

In regard to its use for road-making, for which it is well fitted by its solidity, dryness, and uniformity, Sarrazin gives the following warning. If the pyrites contain any zinc, sulphate of iron and sulphate of zinc are formed, by oxidation, and after a long time spread to the land adjoining and destroy the vegetation, rendering the land useless.

Girardin, Aimé, Morin, and Henri have described in *Ann. Chem. Phys.* the four largest deposits of pyrites, and analyzed 28 of those used in France for making sulphuric acid. The percentage of sulphur in these varies from 30 per cent to 53 per cent., with an average of 45½ per cent. In 5 they report traces of arsenic; in 5 others a slight trace, while in the others the arsenic was reported at from 0·01 to 0·23 per cent. In 1874, as much as 174,400 tons, worth $1,200,000, were consumed in France; of which the mines at Sain-Bel, Department of the Rhône, furnishes 121,000 tons. Belgium, Norway, and Spain furnished 18,000 tons. The consumption of acid has increased two-fold in France and three-fold in England within ten years, much of the increase being due to its use in the manufacture of fertilizers. A knowledge of the foreign constituents of the ores, especially arsenic and gangue, is very important to the manufacturer. The arsenic passes into the numerous products which are made by the use of sulphuric acid from pyrites; carbonate of lime is decomposed in roasting the pyrites, and is detrimental, first by producing carbonic acid, which renders the gases impure, and secondly by forming sulphate of lime, which involves a loss of sulphurous acid and makes the use of the burned pyrites in metallurgy difficult. Fluoride of calcium (fluorspar) produces hydrofluoric acid, which produces injury in the leaden chambers, by attacking glass vessels used to hold nitric acid, so that the latter comes into contact with the lead and destroys it.

The sulphuretted hydrogen gas produced in the manufacture of sulphate of ammonia is utilized in Kunheim's works in Berlin in this way, that the gas is conducted into the pyrites furnace, where it comes into contact with the glowing pyrites and is completely burned. In this way they not only recover the sulphur that would otherwise be lost, but also avoid injury to their neighbors from the odor of escaping sulphuretted hydrogen. The nitric compounds contained in aniline residues are utilized at the Schœnebeck works by passing these acids through a Glover tower.

A Curious Underground Railway Accident.

In the open country, where unfenced road crossings are frequent, it is easy for cattle to stray upon the track, and it is not surprising that accidents from such causes should take place. But that a disaster should occur upon an underground railway in the heart of a great city, seems almost incredible. Such, however, was the actual fact, recently, in this city, the scene of the accident being within the central tunnel of the Harlem Underground Railway, Fourth avenue, near 57th street. The New York and Boston express train was at that point approaching the station at 42d street, half a mile distant, when the engineer discovered four wild bulls upon the track. The locomotive struck the animals and was thrown from the track. The passengers were greatly terrified and jarred, but no person was injured. All the animals were killed. It appears that they belonged to a herd of wild Texan cattle which was being driven across the city; and on passing the level ground near the Grand Central Depot, in front of the tunnel railway entrances, these four animals suddenly wheeled and dashed off into the middle tunnel on a full gallop and encountered the locomotive as stated. It is evident that the entrances to the underground railway need to be better guarded. Perhaps some ingenious person can devise a system of gates to be operated by the cars.

Artificial Lemonade.

Loaf sugar 2 lbs., tartaric acid ½ oz., essence of lemon 30 drops, essence of almonds 20 drops. Dissolve the tartaric acid in two pints of hot water, add the sugar, and lastly the lemon and almond; stir well, cover with a cloth, and leave until cold; put two tablespoonfuls into a tumbler, and fill up with cold water. This drink, it is said, will be found much more refreshing and more palatable than either ginger beer or lemonade, and costs only 30 cents for ten pints. The addition of a very little bicarbonate of potash to each tumblerful just before drinking will give a wholesome effervescing drink.

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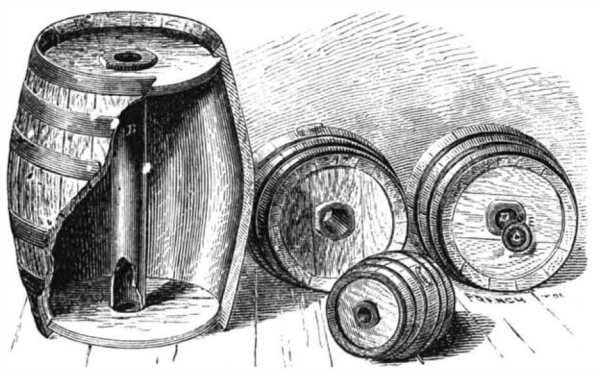
HOFFMAN'S IMPROVED BEER CASK.

The object of this device, which is intended for the use of brewers' uses, is to provide a simple and effective mode of rapidly cooling beer. A metal tube extends from end to end of the cask, and is fastened to the heads. The ends of the tube are secured and closed by means of adjustable taps or are pivoted to rings or a box which incloses the ends of the tube. The device is readily and cheaply applied to casks and barrels now in use.

Among the advantages claimed are that the tube gives great resisting force to the barrel, and that the tube may be



charged with ice, thus causing the beer to keep in good condition.

Patented July 10, 1877, by Mr. John Hoffman, Toledo, Ohio, who may be addressed for further particulars.

ELECTRICAL APPARATUS TO INDICATE OVERSTRAIN OR WEAKNESS IN BRIDGES OR OTHER STRUCTURES.

This invention relates to certain means of obtaining a prompt indication of the unsafe condition of such structures as bridges, roofs, etc., when such unsafe condition is caused by overloading or undue or excessive strain of any member or of the whole structure, or by derangement of parts at joints or connections, or by any change of condition, either sudden or gradual, from that under which the structure was designed to serve.

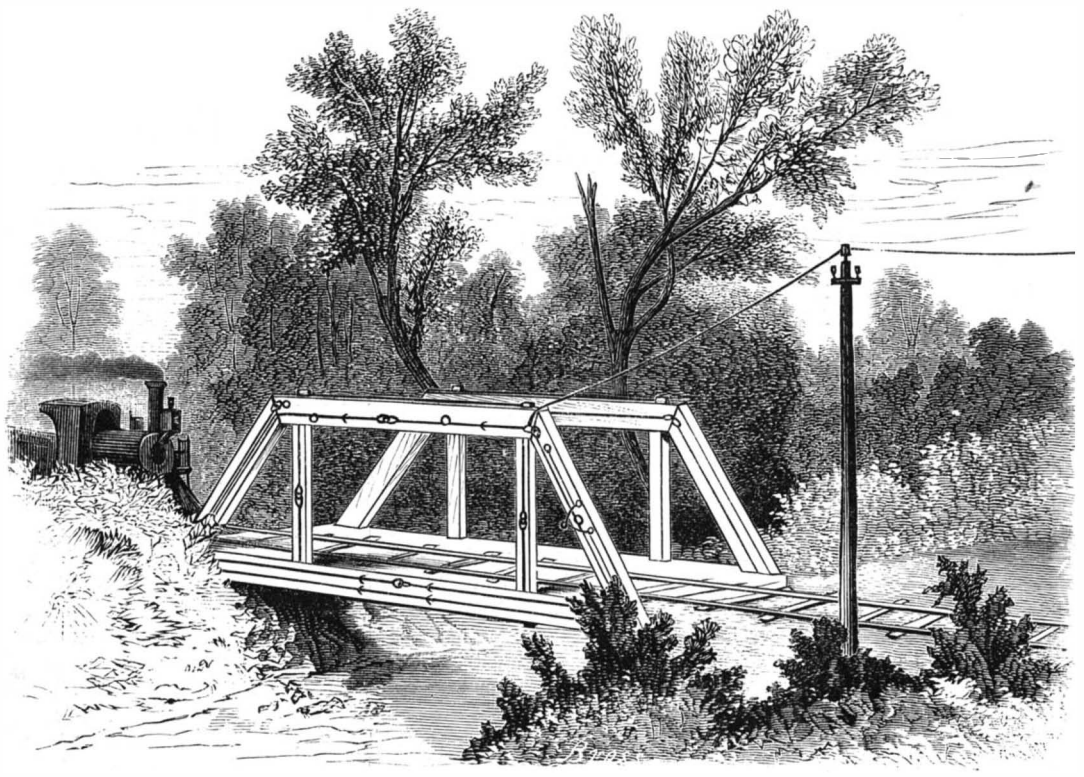
In the case of a bridge, for instance, the various members of which are subjected to either tensile or compressive strain the several proportions of such members are so adjusted as to afford a determined margin between the ultimate breaking load or strain and the greatest load or strain to which such member is intended to be exposed under traffic or use. This margin may be reduced by various causes, as the passage of an excessive load, a sudden jar produced by slight obstructions to, or perhaps partial derailment of, wheels, breaking of flanges, etc., or within the structure itself, loosening of rivets, gradual weakening of the member under frequent repetitions of the load, imperfect workmanship, flaws in the material or errors of calculation not apparent at the time of erection. Such lessening of the margin of safety need not be fatal to the structure, provided it can be detected and suitable remedial measures promptly adopted and the originally designed margin of safety obtained.

In the case of members exposed to tensile or compressive strain no permanent injury will result until the limit of elasticity of material is exceeded. Indication of overloading will be recorded before this limit has been reached.

In the case of dislocation or derangement of parts, as the slipping out of position or shutting by of butted joints—as in upper chords, or vertical posts, or oblique struts—in all such and in all similar or analogous cases, it is the object of this invention to furnish a ready means of obtaining a direct indication that such overstrain or derangement has taken place, although no permanent set or immediately apparent evidence may have been left upon the member or structure itself.

The invention consists in attaching upon each member of the structure an insulated wire or conductor, as shown in the cut, so arranged that an electric circuit may be made or broken, by any convenient mechanical means, by the abnormal condition resulting from the excessive strain or dislocation of parts, from whatever cause it may arise, through which a motion either in the substance of the member itself or between contiguous and adjoining members has taken place, the closing or rupture of the circuit to be indicated by an annunciator, operated by the electric current from a battery through electro-magnets suitably arranged, the armature of the magnets being so adjusted that, as in the case of hotel call-bells, a number or indicator shall be exposed, said number to indicate a particular part or member of the structure.

Patented through the Scientific American Patent Agency, July 10, 1877, by John Forbes, of Dartmouth, Nova Scotia.



ELECTRICAL APPARATUS TO INDICATE WEAKNESS IN BRIDGES, ETC.

Amber and Antiquities under Berlin.

The streets have been torn up recently in Berlin, Prussia, for the purpose of putting down a much-needed system of drainage pipes. These excavations, although not nearly so deep as the New York sewers, are unearthing various curiosities, and may contribute something to the geology of that ancient city. According to the *Berliner Fremdenblatt*, a considerable quantity of amber has been found in one of these excavations, in Alexandrinen Strasse. One piece, which was shown to the editor of that paper, was as large as a hen's egg.

The result of this discovery has been the issue of a circular by the city magistrate Duncker, addressed to the officials and overseers of the work, in which he states that the work of sewering the inner portion of the oldest part of Berlin offers an excellent and most desirable opportunity to become acquainted, to a certain extent, with the soil and ground on which the ancient towns of Berlin and Kœlln were built, such as has never before been offered, and may never occur again. In very ancient times two fishing towns named Berlin and Kœlln occupied the spot where the modern Berlin stands; the latter of these has been mentioned as long ago as 1237, the former in 1244. The magistrate, therefore, instructs the officers in charge of the work to observe, first, the layers of earth, and second, to note any articles found which seem calculated to throw light on the state of civilization of early times, and to collect such articles and send them to the museum, in Kloster Strasse, 68. In regard to the artificial soil they are to note whether it is clay, sand, loam, peat, stone, refuse, or the like, and to note what utensils of metal or pottery are found therein. Bones and other remains of animals and men, indications of old walls, pile works, wells, etc., are to be observed. The character of the natural earth beneath the loam and accumulated artificial soil is also to be stated. A table accompanies the circular showing to what articles the attention of the workmen is to be called. The laborers also receive suitable instructions in the circular. Finders of coin and other articles of value will be paid a suitable reward.

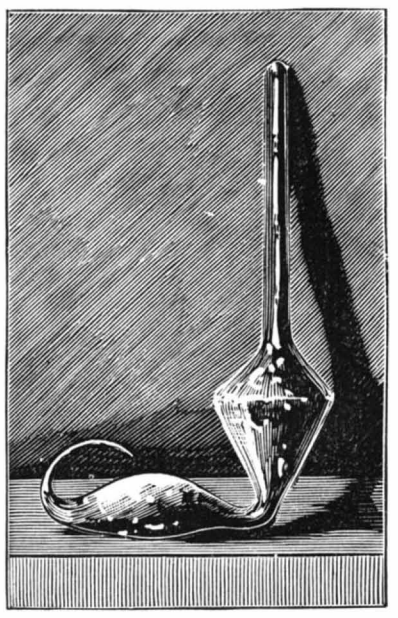
Another of the curiosities already brought to light in these excavations is a dozen wooden coffins found in the Spittel Markt (Hospital Market), near Niederwall Strasse. They were piled one on the other, three deep. These coffins do not date from prehistoric times, but possess a respectable antiquity of at least 260 years. The spot was once used as a potter's field, but has not been used since 1620. Notwithstanding their age, the coffins and the bones in them are perfectly preserved, and in some of the coffins pieces of the clothing still remain.

Professor Virchow is making a thorough investigation of this curious circumstance. He expects to find out the substance with which the wood is saturated and which has protected it from action of the soil. The wood appears to be young oak. The separate planks are 3 centimeters (1·2 inch) thick, and covered outside and in with a thick coat of tar; besides, the coffins seem to have been a layer of lime on the inside. At present the wood is so hard that the workmen have already broken several axes and saws upon it. The planks are held together by large wrought iron nails, which differ essentially in form from those in use at the present day. They are 8 cm. (3⅛ in.) long, 4 cm. (1½ in.) wide, and 2 cm. (⅝ in.) thick. On the broad side of the nail is a peculiar furrow running its whole length, which may probably have served to impart to the nail greater power of holding on.

If these coffins originally contained the bodies of paupers, it may be asked why they were so carefully prepared with tar and lime. If, however, they held the corpses of persons that had died of contagious diseases, may not this have been done as a precaution to prevent a spread of the disease?

Wine 1,600 Years Old.

We do not often drink wine that is 50 years old, less frequently that which has celebrated its centennial, and wine of



200 years age is an absolute rarity. In the famous Kathkeller at Bremen the visitor is shown casks of wine of wonderful age, and looks with admiration on the cask labelled 1624. The celebrated French chemist Berthelot recently had the pleasure of exhibiting to his colleagues in the French Academy of Sciences some wine about 1,600 years old. He had even succeeded in separating the alcohol from this wine, so that the assembly could see alcohol of 1,500 or 1,600 years age. The color of this ancient wine is not very tempting; in taste and smell it is not remarkable, and it is doubtful if a connoisseur would be pleased to find it on his table.

Berthelot spent the month of May in Marseilles, and while there visited the Borely Museum. His curiosity was excited by a glass vessel which was sealed up and contained some liquid. What kind of a fluid could it be? The Professor obtained permission from the Mayor of Marseilles to open the vessel and take the liquid with him to Paris. The total quantity was only 35 cubic centimeters (about 1 fluid ounce or wineglassfull). The liquid is genuine wine, is of a brownish color, and contains, in suspension, a solid substance, which does not form a sediment; the odor is decidedly vinous, with a very perceptible aroma, and reminds one of the taste of wine which has been boiled in contact with fatty substances, or, if you please, of sweet apple wine. The taste is strong and hot on account of the large amount of alcohol, together with acid and a trace of some aromatic substance. The coloring matter had almost entirely disappeared already; and only a trace of sugar was found in the wine. The percentage of alcohol corresponds to that of a weak wine; the proportion of acid is almost normal. This is probably the first time any one has handled alcohol of such age. The liquid had kept thus long because it was hermetically sealed up in a glass vessel—a very uncommon occurrence. The tube which held the wine was blown out like a hanging lamp, and after being filled with wine was very neatly melted together, just as it would be done to-day in our blowpipe flame.

The composition of the glass itself indicated a great age, and like all antique glass was rich in potash and poor in lime. This tube was found at Aliscamp, near Arles, on a broad plain which had been used in the time of the Romans as a burial or funeral place; a farmer who was plowing unusually deep brought it to light. The antiquarians are inclined to the belief that there was once a glasshouse at Arles which produced very fine workmanship. The glass tube was made on French soil, and probably reaches back to the first occupation of Gaul by the Romans.

In regard to the motives which led to the wine being so carefully sealed up in a glass tube, Berthelot thinks that it may be attributed to some religious ceremony or offering to the spirit of the departed. The place where it was found, "Campi Elysei," a burial place that was examined long ago, adds another argument in favor of this view.

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THE BOX TORTOISE.

BY C. FEW SEISS.

"Land turtle" is the appellation by which this chelonian is commonly known. Its correct herpetological name is *cistudo clausa* (Gmelin). Dr. Holbrook describes it under the name of "*cistuda Carolina*—Edwards" ("North American Herpetology," 1842, vol. I., page 31), and Professor Agassiz, the *cistudo Virginea*, of Grew ("North American Testudinata," 1857, vol. I. page 445).

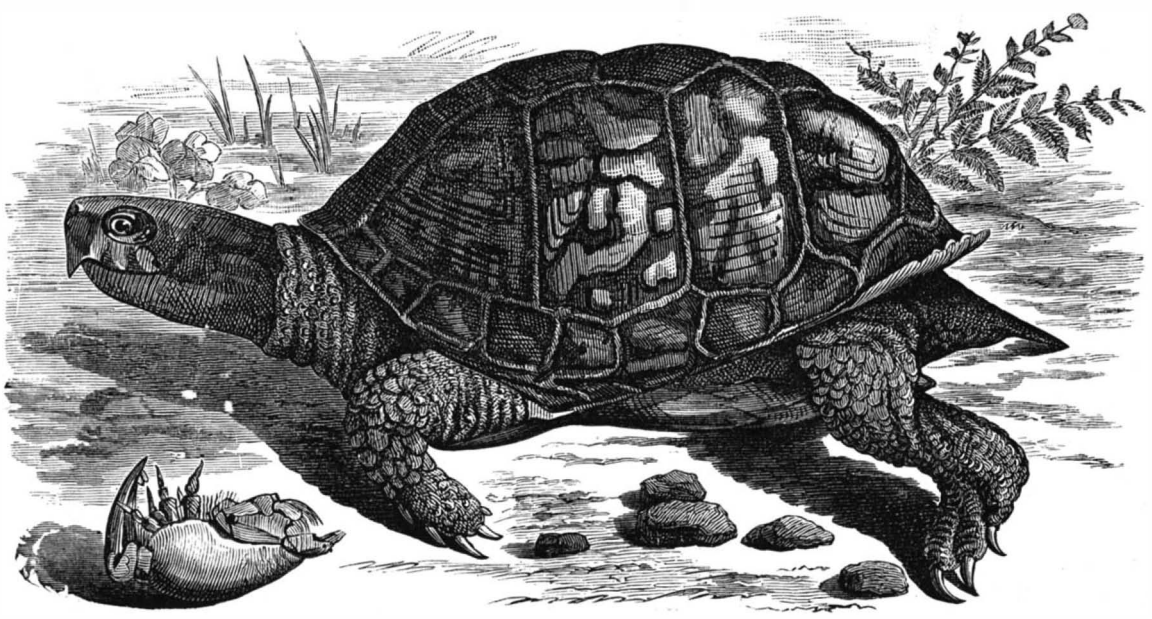
Few reptiles vary in color so greatly. I have examined individuals of this species which were of a uniform blackish-brown color, entirely spotless; others bright yellow, with black blotches and rays; others black, with yellow spots; and still others, reddish yellow, with black and brown spots, lines, and dashes. It is impossible to find two individuals of this species exactly similar in coloration.

The box tortoise is polyphagous. I have known it to eat berries of many kinds, apples, melons, tomatoes, earth worms, and carrion; and, in captivity, green corn, and meat, both raw and cooked. I believe *it* might subsist entirely upon "buns and water crackers." I emphasize the "it," for this reason: A tender-hearted lady, a member of the Society for the Prevention of Cruelty to Animals, having observed the boa constrictors at our Philadelphia Zoölogical Garden were fed with living pigeons and rabbits, suggested "buns and water crackers" be substituted, and thus avoid cruelty to animals! I suppose the old lady thought the very sight of the food named by her would cause the boas to smack their labials in wild delight, and to cause them to exclaim in the ophidian tongue, "Oh buns! yum—yum—yum!"

The female box tortoise, when young, lays one or two eggs; when older, six or more. The eggs are nearly globular in form, and are of a dirty or yellowish-white color. Like the eggs of serpents, they are covered with a tough skin, not with a hard shell as in the birds. The eggs are deposited in holes in the ground, which the female tortoise excavates with her hind legs and feet only, using them alternately, throwing out the loose earth with her feet. One or two eggs are laid in each hole, and are carefully covered over before she quits the spot. The whole number of eggs are generally deposited in the immediate vicinity.

This tortoise is irregular in its time for going into hibernation. So long as the weather is warm it remains above ground, but when the weather grows cold and unpleasant it creeps beneath the surface of the soil. A late or early going into hibernation does not foretell the mildness or severity of the winter following. The winter of 1875 was extremely cold, yet our *cistudos* did not go under the ground until November 3, 1874, while they buried themselves about the middle of October in preceding winters which proved to be moderate.

In the female *cistudo* the under shell (*plastron*) is concave, while in the female it is flat. The specimen from which my sketch was made, is an old male, weighing a small fraction less than one pound. The little crustacean in the foreground is common in the ocean about the sandy beach of Atlantic City, N. J.



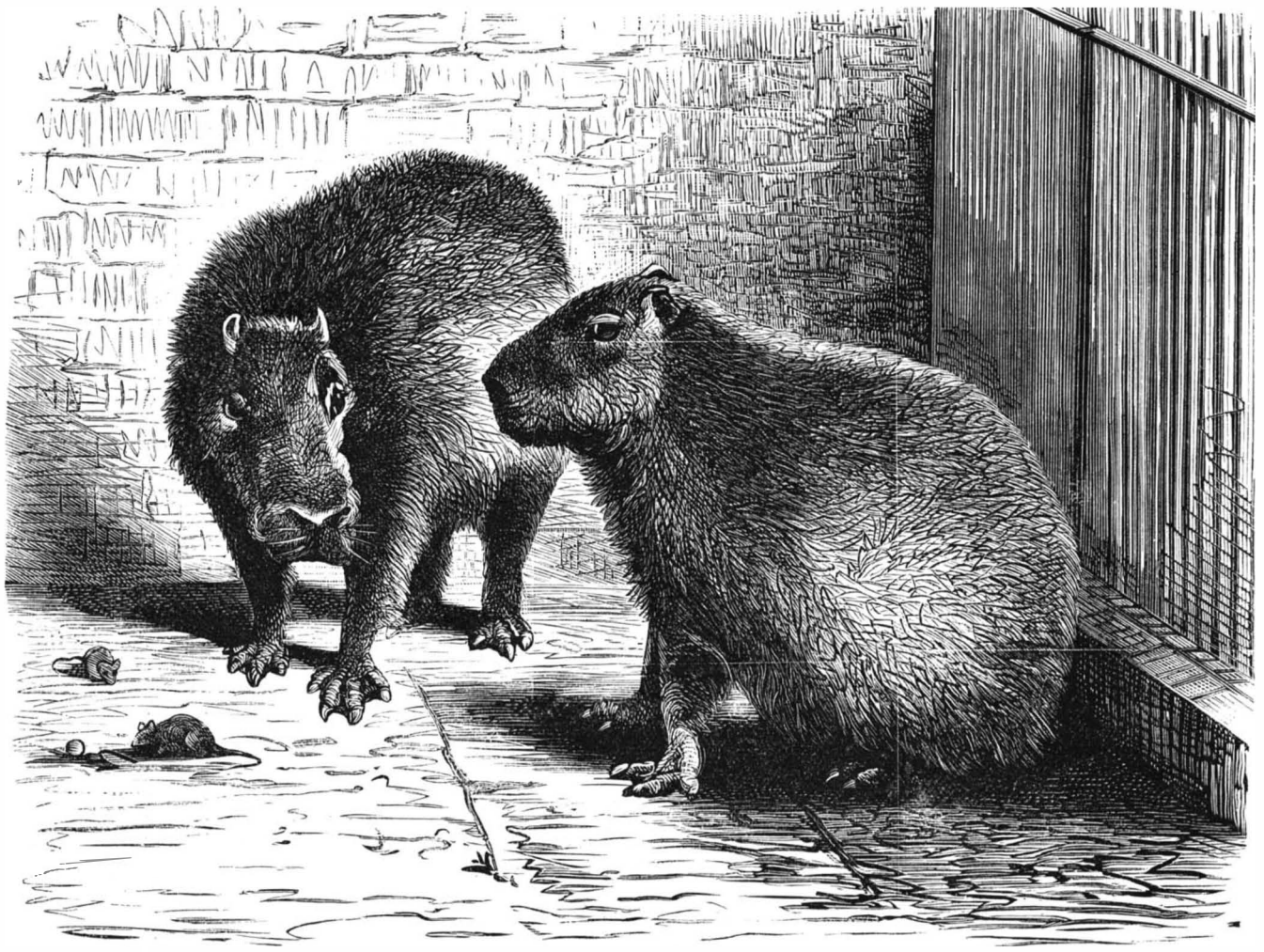
THE BOX TORTOISE.

Compounds of Silicon with the Platinum Metals.

When platinum is fused in a clay crucible lined with charcoal, it becomes crystalline on cooling and may be readily pulverized. Boussingault has shown that when platinum is fused with charcoal that contains silicic or sand, or in a clay crucible lined with charcoal, it takes up 2·2 to 5·9 per cent of silicon. Under the same circumstances the other metals of the platinum group take silicon as follows: Iridium, 3·7 to 7·0 per cent; palladium, 3·4 per cent; ruthenium, 2·1 per cent. Carbon is not taken up by these metals, and further experiments show that by igniting carbon strongly with silicic acid, the latter is partially reduced; at very high temperatures the reduced silicon volatilizes and is absorbed by a slip of platinum foil held over the ignited mass.

WATER HOGS.

The South American capivari or capybâra (hydrochoerus capybara) is called water hog, on account of a superficial resemblance with the hog. It is the giant of the rodents, and for this reason is an interesting subject for the zöologist. The two London specimens are of about the size of half grown hogs. Their color is a dirty grayish, which changes on the back into a reddish or grayish-brown. The bristle-like hair has a length of from one to two inches, and hardly covers the body. It is thickest at the hind portion of the back. The nose is flat, the eyes are expressionless and set back a considerable distance, forming the main features of the head. The neck and body are strongly built; the hind legs have three and the fore legs have four toes that are provided with broad, rounded-off nails and connected by webs. The tail is only indicated by a short, horny protrusion.



THE WATER HOGS IN THE ZOOLOGICAL GARDENS AT LONDON.

According to Burmeister, Rengger, and Darwin, the capybara is found frequently in the rivers and waters of Brazil and Paraguay. It is hunted for its meat and skin. It forms the main prey of the jaguar. The food of the water hog consists of water plants and roots. It lives singly and in herds; takes refuge in case of danger in the water, and swims with ease for a considerable length of time. The largest specimen, obtained by Darwin, had a weight of over one hundred pounds, and the length of the largest water hog measured by Burmeister was about five feet long; but it is not unfrequent that dry skins of the animal are sold by dealers of much greater length.

Substitute for the Tourniquet.

It has been customary to furnish workmen on English railroads with tourniquets for use, in case of accidents involving hœmorrhage, until medical aid could be obtained. On the London and Northwestern Railway, for the past fifteen months, elastic tubes have been substituted for the tourniquets, with such excellent results that large additional supplies have been ordered. The tube terminates in a hook at each end, and is simply applied while stretched, and the hooks fastened to each other. The advantage seems to be that much less skill is required in the use of the tube than in the application of the tourniquet, and that it is more certain in its action.

Japanese Mirrors.

Repairing of mirrors is a process to which the art of Europeans and Americans has not yet arrived. As they make mirrors in Japan, however, the process of repairing is no more difficult than that of mending a stove. The Japanese mirror would seem to be only an improvement on that used by Helen of Troy—a metallic affair burnished and polished. It is a bronze disk, composed of eighty parts of copper, fifteen of tin, and five of lead. It is cast in a mould composed of powdered stone and pulverized crucibles. The casing is polished by hand, as the Japanese alone can polish; and the last process is to rub the surface of the mirror with an amalgam composed of quicksilver, tin, and lead. And this is done by hand and with a piece of wash leather, till the mirror has a bright reflecting surface. This surface solves the problem of repairing *some* mirrors, since it can at any time be readily repolished.

At every stage of the work the choicest materials are employed. The cheaper mirrors have sulphide of lead and antimony instead of tin in their composition.

A curious optical effect can be produced by some of these mirrors—probably the best finished. On the reverse, which is also polished, are words and figures in relief. By throwing in a bright sunlight the reflection of the mirror on a screen, these figures are seen to shine through the reflected surface of the mirror. The fact is noted by an English professor in the University of Tokio, R. W. Atkinson. He has been able to discover no satisfactory solution of the phenomenon, but it is certainly one worth investigation. The body of the mirror is absolutely opaque, and there must be some law of refraction, yet not fully discovered, to account for an appearance so singular.—*Philadelphia Ledger.*

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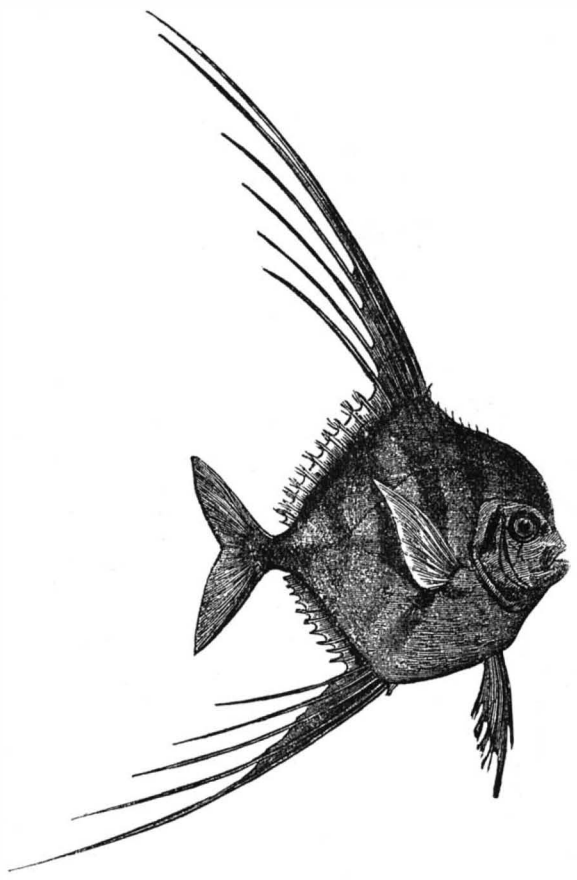
THE CORDONNIER, OR COBBLER FISH.

This fish (*caranx cilianis*) derives its name from the long sharp spines of the dorsal and anal fins, which to many persons have a fancied resemblance to the awl and bristles employed by cobblers in their trade. It is found quite common in various localities, from the Red Sea, throughout all the Indian seas, and is a good example of the genus to which it belongs. No less than seventy species having been classed in this genus.

The form of this fish is sufficiently curious to render it a conspicuous species, and it may be easily distinguished from



its many congeners by an oblong spot on the aperculum and six black bands that are drawn across the body, reaching nearly to the abdomen.

HOW TO CHUCK AND BORE AN ENGINE CROSSHEAD.

A correspondent asks: "How can I chuck a crosshead for a 12 horse engine, and ensure that the holes for the piston rod and the wrist pin shall be true and at right angles with each other?" If the crosshead is a forged one, or if it is of cast iron and the first one cast from the pattern, it will be necessary to line it out with a square, compasses, and scribing block to ensure that there is stock enough to allow it to work clean; if, however, it is known that there is ample material to come off, this may be omitted. The hole for the wrist pin should be bored first, because one hole must be used in connection with a mandril when chucking the crosshead for the second boring. It is easier to turn a mandril for the wrist pin hole than to turn one for the piston rod hole; and furthermore, the wrist pin mandrel can extend through both sides of the crosshead, which would be inconvenient in the case of the piston rod hole on account of the taper.

If the crosshead is lined out, and the lines are carried the full length of the casting or forging, they will still be too short to set the crosshead by, because the thickness of a fine line in the length of the crosshead becomes considerable when multiplied by the length the connecting rod will be; hence, when the crosshead end of that rod is connected, a very minute variation from being square with the wrist pin will cause the connecting rod to require to be sprung to come as it should be with the crank pin journal, unless, indeed, the error be corrected by filing the bore of the connecting rod to suit the want of squareness in the wrist pin. If the latter expedient is resorted to, the brasses at that end will wear unduly on one side face. From these considerations we proceed as follows: We first chuck the crosshead to bore the hole for the wrist pin, clamping it to the face plate of the lathe, and setting it to the scribed lines, if there be any; or we may chuck and hold it by the outside of the metal, trying it with the surface gauge as well as making it run true. By so doing, if there is a want of truth in the casting or forging, between the part parallel with the lathe centers and that parallel with the lathe face plate, we may divide the difference between the two. While setting the crosshead, the holding plates should not be screwed up too tight, so that the work may be moved without giving it heavy blows. When the work is set, the plates must be tightened up gradually, first tightening one a little and then the other, until whole are sufficiently tightened. This is necessary, because completely tightening one bolt first may spring or force the work out of true. After the whole of the bolts are tightened the setting should be tested, to ensure that the work has not moved. The next procedure is to balance the weight of the crosshead upon the lathe face plate by bolting thereon a weight as a counterbalance, testing the balancing by pulling the lathe round by hand and observing if the face plate always stops with one particular part of the work uppermost. If it does, further counterbalancing is necessary. The hole should be bored with a stout tool, held as close in to the tool post as the circumstances will admit. The last boring should be taken at a comparatively fast speed, and with a fine cut.

The next operation is to turn up a mandrel to fit the holes bored as above. The length of this mandrel should be equal to the diameter of the lathe face plate. This mandrel need not be turned from end to end, but only just as far as to let the mandrel stand central with the face plate when the crosshead is chucked the second time. The mandrel should be for an inch at each end parallel and of equal diameter, its middle being a snug fit, so as to drive very lightly into the two wrist pin holes.

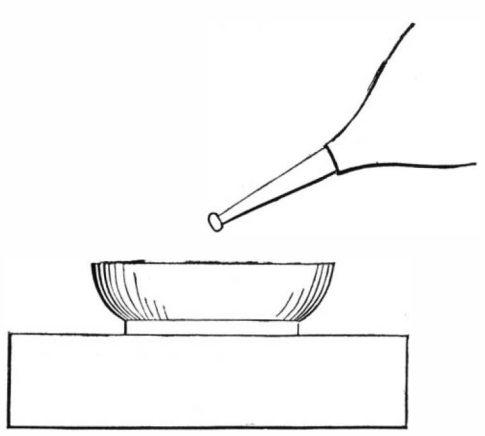
Then chuck the crosshead to bore the piston rod hole, setting it so that the mandrel stands exactly parallel with the face plate of the lathe, and making the outer end run true according to the outside of the metal. To test the setting, the surface gauge is held against the face plate and the hook end of the surface gauge scriber is tried over each end of the mandrel, taking care that the scriber point touches the mandril very lightly, as otherwise it would be apt to spring. After the turning at this end is roughed out, it would be well to test the work again, because sometimes the packing used in setting the work will compress a little, throwing the work out of true. In cases where the rod end is tried into the hole to fit the taper, watchfulness is required to see that trying the rod does not affect the setting of the work. In finishing the work, two or three fine cuts should be taken so as to ensure a clean, true, and smooth taper hole, which will not take much grinding to get a smooth polished bearing. Instead of using a chalk mark upon the rod end in trying it into the crosshead, it is better to use a little Venetian red mixed with lubricating oil, giving the work a very slight coat.

SIMPLE WAY TO MAKE ICE.

Among the different principles on which the production of artificial cold is founded, stands foremost the evaporation of volatile liquids, during which evaporation the heat made latent in the vapor causes its temperature to be far below that of the liquid from which it originates, and so robs the remainder of this liquid and the surrounding bodies from a great deal of their heat, in this way producing a cold of which the intensity is proportional to the rapidity of the evaporation, and therefore depends greatly on the degree of volatility of the liquid used.

It is a common lecture room experiment to freeze a small quantity of water under the bell jar of an air pump, when the vacuum is produced with sufficient rapidity; a tablespoonfull of water placed in a watchglass may be frozen in less than a minute, all what is necessary is that the pump be able to remove the watery vapor formed as fast as it is generated. If the air pump is not in perfect condition, it is necessary to add some auxiliary agent, and this is to place under the bell jar a flat dish filled with sulphuric acid; this, by its great affinity for watery vapor, aids the action of the pump, and makes the experiment successful, even if the pump is in a lesser degree perfect.

This lecture room experiment has been modified into a practical machine by Carré of Paris, and is since some years in operation in many of the Paris restaurants. It consists of a hand air pump, which exhausts the air and watery vapor from a strong glass bottle half filled with water, while this air and vapor before reaching the pump passes through a cylinder with sulphuric acid, which retains most of the watery vapor and makes the evaporation so rapid that a quart of water can be easily frozen in a few minutes, according to condition of machine, of season, and locality.

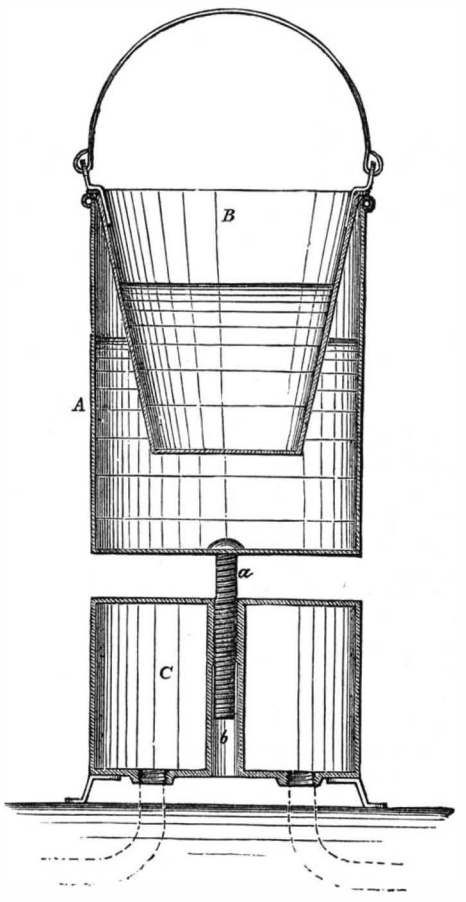


But in place of freezing water by its own evaporation it is more advantageous to use a liquid of greater volatility, such as ether, carbon bisulphide, liquid ammonia, chymogene, or even liquefied carbonic or nitrous oxide. The latter two substances are indeed so volatile that it requires no machinery to freeze water with them; it is sufficient to surround a vessel with either of those substances, when the water in it will be rapidly congealed.

Less volatile substances may also be made to evaporate rapidly enough to freeze water, without the aid of vacuum pumps, by simply aiding their evaporation by means of a blast of air. Böttger has published a simple method of which the whole apparatus required is represented in the engraving. It consists in a flat dish of very thin sheet copper, in which some carbon bisulphide, ether, or chymogene is poured; this dish is placed on a small square board of pine wood, on which some water is placed, so as to be between the board and the bottom of the dish. When in this condition the nozzle of a bellows is kept over it in the position indicated in the figure, and by working the bellows a blast of air is thrown upon the surface of the volatile liquid in the dish, and so its evaporation accelerated. After continuing this for a little while, the water under the dish is found to be frozen.

IMPROVED GLUE POT.

The desirability of keeping glue, while being used, at the right temperature, and avoiding all liability of its boiling



over, on the one hand, or of becoming chilled on the other, is well known to mechanics who have occasion to prepare and use the material. By the invention illustrated herewith this is claimed to be accomplished with certainty and without trouble. To the center of the under side of the bottom of the shell, A, is secured a screw, *a*, which extends downward and at right angles to the bottom. C represents the base, from which emanates the heat designed to dissolve the glue. This base has formed through its center an orifice, *b*, which has within it screw threads corresponding to the threads on the screw, *a*. The upper surface of the base, C, is closed, as well as its under surface. The screw, *a*, after being entered within the orifice, *b*, may be received entirely within said orifice, or but partially so.

Heat being applied into the base, C, by steam, or in any other desirable manner, the shell, A, of the glue pot is turned so as to send the screw, *a*, after being entered within the orifice, *b*, which will bring the under surface of the shell closely in contact with the upper surface of the base. In this position the greatest amount of heat is brought to bear upon the glue pot, and the glue within it very speedily begins to boil. Now, to keep the glue, after being properly prepared, at the requisite temperature, it is only necessary to revolve the shell, A, until its bottom is brought out of contact with the surface of the base. In this position a stratum of air, entering between the base and the bottom of the shell, will modify the temperature to any degree desired; and by simply screwing up or down the cylinder, A, bringing it nearer to or further from the upper surface of the base, the glue may be kept on the boil, or simmer, or otherwise, at pleasure, without danger of boiling or getting too cool to use. This invention was patented January 11, 1876, by Mr. C. S. Comins, of New York city.

Hospitals for those who can Pay.

What is called the Home Hospital Association has been organized in London for the purpose of providing comfortable hospital accommodation, with skilled nurses, in various parts of London, for the benefit of patients who can afford to pay for such advantages. Such hospitals will not only be a great convenience to the public, but will prevent the abuse of charities intended only for the poor.

A scheme is also on foot in London for the establishment of a large hospital composed of separate departments, each devoted to special diseases. It is thought that in this way one general medical staff may be able to superintend the whole institution, and that the material may be rendered more valuable for purposes of clinical instruction.

AN analysis by Charles C. Dreuding shows that the organic constituents of cotton root bark are a red and a yellow resinous coloring matter, fixed oil, gum, sugar, tannin and chlorophyll.

ON August 20th last, Frederick Cavill swam the English channel, twenty miles, from Cape Grisnez, France, to Dover, England. Time, 12 hours.

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Rise and Progress of the Beet Sugar Industry in France.

The following is extracted from the Inaugural Address delivered by M. Drouyn de Lhuys at the Agricultural Congress at Compiegne:

Though the avowal be made at the cost of patriotism, it must be owned that the art of extracting sugar from the beet, which has now attained such a marvelous development, is not of French origin. Even the plant itself is not indigenous, having been introduced from Bohemia by the barbarian hordes that ravaged Gaul at the time of the Roman Empire. In his "Theatre d'Agriculture," Oliver de Serres speaks of it as a kind of forage, and appears to have presaged the possibility of extracting the matter which furnished its fermented juice. Its value as food for cattle was enthusiastically advocated by the Abbé Commerel, in a pamphlet published at Paris in 1786, under the title of "Instruction sur la Culture, l'Usage, et les Avantages de la Betterave Champêtre."

The honor of having demonstrated the existence of sugar in the beet belongs to a German chemist, named Margraff, who was born in 1709. He conceived the idea of treating various indigenous saccharine plants, such as carrot and beetroot, with alcohol, and established the fact that beets contain as much as 6 per cent of their weight of sugar. The following extracts from a memoir, which he published in 1745, show in an interesting manner how this valuable discovery, of whose immense future he could have no conception, gradually dawned upon Margraff: "I took the roots of white beet, cut them into slices, and allowed them to dry. Then I reduced them to a coarse powder, eight ounces of which I put into a stopped bottle, and poured upon them sixteen ounces of rectified spirits of wine. The whole was then subjected to heat, which was pushed up to the boiling point of the spirit, while the powder collected at the bottom of the vessel was stirred about from time to time. Immediately the boiling point was reached I removed the vessel from the fire, poured its contents into a small linen bag, and squeezed out the liquid part thoroughly from the latter. The liquid thus expressed was filtered while still hot, poured into a flat-bottomed glass vessel, corked up, and set aside in a cool place. The spirits of wine at once became turbid and at the end of some weeks small crystals were formed, having all the characteristics of tolerably pure sugar. These I dissolved anew in spirits, and thus obtained them of greater purity."

This procedure of Margraff was a mere laboratory experiment. Half a century had still to pass before any practical application of his discovery was made. The second step was also the work of a German, though his name, Achard, indicates descent from a French stock. In 1795 he grew large quantities of beet on his farm in Silesia, and extracted from them sugar in abundance. He even got as far as refining the product, and in 1799 presented specimens of loaf sugar to Frederick William III. of Prussia.

In 1800 Achard published his method in a work entitled "Instruction sur la preparation du Sucre brut, du Sirop, et de l'Eau-de-vie de Betterave," which attracted the attention of the Institute of France. This body caused a detailed report of the new industry to be drawn up, the matter being then of much consequence owing to the loss of the French colonies. Sugar became still dearer when the Continental blockade suppressed maritime traffic, rising then to six and even twelve francs per kilogramme. Impressed by the necessity of procuring for the population an article of diet which had by this time become an actual necessary of life, the Government caused experiments to be made, one by one, upon all plants cultivated in France which were in any degree capable of replacing the sugar cane. In this manner grapes, plums, maize, sorgho, carrot, and maple were passed under review. Rewards were offered for the encouragement of investigation, and in 1810 Proust received from the Emperor Napoleon the Cross of the Legion of Honor and a sum of 100,000 francs for his discovery of grape sugar; while one of his competitors, Fouquet, was awarded 40,000 francs in acknowledgement of his efforts in the same direction. Grape sugar, however, is not crystallizable; it is friable; it must be employed in quantities twice or thrice as large as are required of cane or beet sugar; and in the form of syrup, extracted directly from the grape, it is even less satisfactory.

Further researches were necessary, and now the turn of beet root came. The first French factory for the extract of sugar from beet was founded at Lille, in 1810, by M. Crespel-Delisse. Some Spaniards interned in the Departement du Nord, who were familiar with the manufacture of cane sugar, lent him their assistance as workmen, and the venture soon became a great success. From 400 kilogrammes manufactured the first year, the output rose to over 10,000 in the next. The Institute had nominated a commission, composed of Chaptal, Fourcroy, Darcel, Guyton-Morvan, de Cels, Teissier, Vauquelin, and Deyeux, who were meanwhile occupied in studying the methods recommended by Achard, and seeking to improve upon them. On March 21, 1811, a *resumé* of their investigation appeared under the title of "Instruction pour Extraire le Sucre de la Betterave." Soon the impetuous genius of Napoleon, excited by a report of Chaptal's, aspired to solve the problem by main force. A decree of January 15 directed the creation of five schools of chemistry, to which 100 pupils were to be attached, 100,000 acres of land were to be cropped with beet, and four imperial factories at once established. The downfall of the Empire carried with it the ruin of this organization, established at enormous cost, by re-establishing ocean traffic, and the restoration of the colonies. On the same day that peace was declared the price of sugar fell two thirds, and declined, little by little, to 1 fr. 40c. per kilogramme. The majority of home-grown sugar makers at once succumbed in the unequal contest, but some few brave spirits still maintained the competition. Among these was M. Crespel-Delisse, who had already gone through the crises of 1812 and 1814. With renewed energy he established a central refinery at Arras, attached to it nineteen agricultural estates, destined to supply its wants in raw material, and constructed special workshops for the manufacture of the necessary plant. His contribution to the general output of sugar in the whole of France rose to 4,000,000 kilogrammes yearly. In 1824 M. Crespel-Delisse's labors were made the subject of a special report by Chaptal; in 1827 he was awarded the great gold medal, and 1864 the Government of the Second Empire claimed for him a national recompense as a public benefactor to his country.

It is scarcely necessary to recall how few industries have had such difficulties to surmount and have achieved such rapid successes. In fact, the produce from the beet, when first called into unexpected competition with that of the cane, was little more than a coarse brown sugar (*cassonade*), and there has been no lack of pleasantries at its expence. Many may remember a caricature representing the little King of Rome holding a beetroot in his hand, and crying sadly, "Papa *says* that it is sugar." Nowaday it is assuredly sugar, and good sugar too. But what vigorous efforts and what indefatigable perseverance have been required to attain this end! To achieve this victory nothing less than a triple alliance of agricultural, chemical, and mechanical science has sufficed.

Let us measure by the aid of figures the distance we have traversed in our onward march since 1827. At that date the annual production of sugar was estimated at 1,000,000 kilogrammes, in 1840 at 27,000,000 kilos., in 1852 at 75,000,000 kilos., in 1846 at 247,000,000 kilos., and in 1871 at 336,000,000 kilos. In 1875 the production had risen to 450,000,000 kilos., while the home consumption did not exceed 250,000,000 kilos., and thus 200,000,000 were available for exportation. Looking back to the glass vessel in which Margraff first crystallized the juice of beet, heated with spirits of wine, it must fain be acknowledged that the career of the home-grown sugar in Austria and in France has been a brilliant one indeed.

Epitaph on an Engineer.

The *Chicago Age of Steel* says that the following epitaph is genuine:

Here lies in a horizontal position,
The remains of
George Washington Brown,
Steam Engineer,
Whose abilities and skill were an honor
To the craft.
His fire was even; water-line at the middle cock;
Steam—just right.
Every action was marked by the pressure gauge,
And limited by the safety-valve,
And so accurately was his machinery regulated
By the governor,
He never met with an accident,
Until most mysteriously—'twas an unlucky day—
Boiler, engine and building, with mortals ten,
All went up
Higher than a kite!
Poor Brown, with nine others, departed this life
By steam
Aged 46, Cincinnati, O., April 14, 1871.
At the inquest,
The Coroner held the deceased "a blameless man."
He was always true;
'Twas the iron that was false;
Providential—so it was to be.
Peace to his dust.

The School Blackboard.

A correspondent of the *New England Journal of Education* states that the Rev. S. R. Hall, LL.D., who recently died in Brownington, Vt., at the age of 82, where he was pastor of the Congregational church for some thirty years, originated the notion of using a blackboard in schools. He first used it in Rumford, Me., in 1816, to illustrate arithmetic. The first one was made of black paper, which he marked upon with white chalk. The notion was at first ridiculed, but Mr. Hall persisted in its use, and finally met with favor He next used it in Concord, N. H., where he taught for some years. Here it was a great novelty in the public schools, and many visited the school to see its use; but this way of explaining arithmetic was so successful that it was adopted very soon after 1812 all through New England, and now no teacher seems to be able to get on without it.

New Steamship.

The City of Macon, lately launched from the yard of John Roach, Chester, Pa., has been built for the Ocean Steamship Company of Savannah. She is of iron, 2,250 tons; length, 272 feet over all; 38 feet 6 inches beam moulded; depth from base line to top of spar deck, 26 feet 10 inches; depth of hold, 24 feet 10 inches. She has two compound surface condensing engines of 1,650 horse power. Her boilers are four in number, and are tubular cylindrical. Her propeller is of the Hirsch patent. She will ply between New York and Savannah, in connection with the Georgia Central Railroad.

A Satisfactory Grasshopper Machine.

Professor Riley, of the Entomological Commission, has during the summer perfected a grasshopper machine, which seems to be just the thing. It is intended to do away with all extra material, like coal oil, which in the long run is expensive, and to work at all seasons, whether the insects are just hatching or full grown. It is not patented, nor does the Professor intend to patent it, unless it is found necessary to prevent others from doing so. In the *Industrialist*, the organ of the Kansas State Agricultural College at Manhattan, Mr. A. N. Godfrey thus speaks of the machine:

The Mechanical Department has constructed a new locust exterminator for Professor Riley. This machine operates upon the bagging principle. It is, briefly, a large canvas bag stretched upon a light but strong frame and placed upon runners, which extend with curved tips a little in front of the mouth. The canvas is stretched upon the inside of the frame, thus making the bag smooth and even within. This bag has a mouth ten feet long and two feet high, and converges backward to a small box one foot square with an opening covered with wire cloth above, and containing a slide cut-off at the end. This box opens into a small cylindrical bag two and a half feet long and one foot in diameter. This bag is kept in position by two tin hoops attached to a wide runner beneath, which is fastened to the main machine by leather straps. The hinder ring contains the door, which is of wire cloth stretched upon a stout iron ring, which fits tightly within the bag-ring, and swings upon a pivot like the damper in a stovepipe. The door is fastened by a small iron rod dropped through holes in the bag-ring at right angles to the axis of the door. The machine is made to "take more land" by means of two triangular wings about six feet long attached to the ends, from which are suspended a number of teeth or beaters, which, swinging loosely, drive the 'hoppers towards the center. The wings also serve as attachments for the motor power.

On smooth ground the machine can be easily hauled by two men, but where the grass is tall and thick it pulls harder. The locusts on hopping into the machine soon reach the small back portion, enter the small bag and are attracted to the rear end by the light which enters at the gauze door. When a sufficient number are thus captured, the machine is stopped; the cut-off is slid down in the box, thus shutting the 'hoppers in the bag; a hole is dug behind the machine, the bag tipped into it, the 'hoppers buried, and "presto!" the thing is done.

The advantages of this machine are many, some of which are that it requires no additional expense to run it, as for oil, tar, etc.; it will catch the winged locusts as well as the young, if operated on cool morning and evenings; and is adapted to almost all conditions of growing grain. The machine can be made for about ten dollars, and perhaps less. From all appearances the machine will give good satisfaction, and armed with it we may hope to make a successful "strike" against any "locust monopoly" that may try to crush us in the future.

A New Case of Aniline Poisoning.

Not long since we published an article by Dr. Seidler, on the aniline dyes and their effect on the system (SCIENTIFIC AMERICAN, page 40, July 21, 1877). Notwithstanding his very plausible theories in regard to the non-injurious effects of infinitesimal quantities of the poison, if such it be, we have some facts from Berlin that seem to throw doubt on his conclusions. On pleasant Sundays in summer large numbers of the denizens of that metropolis seek recreation in the pleasant retreats of Potsdam, the summer residence of royalty. On the last Sunday of July a large number of these pleasure seekers suffered injury from fuchsine poisoning. It seems that reports had reached the Potsdam police that sickness had followed the partaking of some so-called raspberry extract, a favorite flavoring over there, and usually of a very bright red color. The police at once instituted an investigation and found that the raspberry extract sold by a certain Potsdam merchant contained but very little of the juice of the berry and very much aniline, especially fuchsine. The raspberry juice found was at once confiscated and an official warning published in the Potsdam papers against raspberry juice. These praiseworthy precautions prevented any further poisoning during the ensuing week among the citizens of Potsdam, but the calamity broke out again with greater severity among the Sunday guests from Berlin. A number of persons who had been wandering about the beautiful gardens of Sans Souci were resting in Blume's café near the orangery, and drinking white beer mixed with raspberry extract. Soon after partaking of these, symptoms of poisoning were noticed, nausea and vomiting, etc.; some of the ladies even fainted away. Police-consul Thiedecke, Dr. Frank, and others have attributed this sickness to fuchsine, although some of our readers might consider this strange admixture of raspberry and weiss beer, upon the empty stomach of a weary pedestrian, able to produce sickness without the aid of fuchsine. Be this as it may, Berlin raspberry juice is at least suspicious.

Fire Arms Improvements.

Col. Silver, of London, Eng., has made two very good improvements, specially useful in heavy and rapid firing. The first consists of a soft rubber heel plate, which is readily attached to any gun. It takes up the recoil in an admirable manner, and thus permits the firing of heavy charges with impunity.

The second improvement consists of a hard rubber hand

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guard, made in the form of a sleeve, that slips over the barrel and forms a non-heat-conducting cover. By the use of this guard the gun barrel may be firmly held in the hand even after it has become scorching hot under rapid firing.

Samples of these devices are furnished by Mr. Joseph Dixon, 7 Bloom Grove, Lower Norwood, London.

Professor Loomis' New Meteorological Deductions.

Professor Elias Loomis of Yale College, after examining the immense number of weather observations collected by the United States Signal Service, deduces the following generalizations. The seven papers wherein the detailed discussion has been embodied have appeared in the *American Journal of Science and Arts* whence the summarized conclusions below given are extracted:

1. Areas of low barometer result from a general movement of the atmosphere towards a central area, and this movement is accompanied by a deflection of the wind to the right, which causes a tendency to circulate around the center with a motion spirally inward.

2. This deflection to the right, which results from the earth's rotation, causes a diminished pressure within the area of this inward movement, and the pressure is still further diminished by the centrifugal force resulting from the circulation about a center.

3. The amount of the barometric depression depends upon the force of the wind, and the geographical extent of the revolving atmosphere. The effect of centrifugal force is not considerable except when the velocity of the wind approaches that of a hurricane. With a velocity of 100 miles per hour, the depression due to centrifugal force may amount to about two inches; but in the winter storms of the middle latitudes, with a velocity not exceeding forty miles per hour, the depression due to centrifugal force seldom exceeds one or two tenths of an inch. In these storms, three quarters of the observed depression of the barometer is usually the effect of the earth's rotation: but in order that the depression at the center may amount to as much as one inch, it is generally necessary that this system of circulating winds should prevail over an area nearly 2,000 miles in diameter.

4. In North America, south of latitude 35°, areas of low pressure are less frequent and generally exhibit a less depression than near latitude 45°, because the area over which a cyclonic movement of the winds prevails is small; and this area is small because, if a cyclonic area could be formed having a radius of 1,000 miles with its center in latitude 30°, its circumference must extend southward to latitude 16°, where the trade winds are steady and seldom interrupted. Such a diversion of the winds toward the north, even if it could be produced, could not be long maintained; so that a large cyclonic area with its center in latitude 30° is well nigh impossible; and it is impossible that there should be a great depression of the barometer in latitude 30°, except with a wind having a hurricane velocity. This is believed to be the reason why in North America the centers of great storms are generally found north of latitude 40°.

5. The causes which may produce a general movement of the atmosphere toward a central area are (A) unequal pressure as shown by the barometer; (B) unequal temperature; and (C) unequal amount of aqueous vapor. Of these three causes the effect of the first is generally so decided that the influence of the other two causes can only be detected by careful observation; but when the pressure of the air is nearly uniform over a large extent of country, the influence of the other two causes is sometimes very palpable, and their influence is generally seen in a slight deflection of the winds from the direction they would have if wholly controlled by the first cause.

6. A cyclonic movement of a large mass of air is generally attended by an upward motion in certain localities, chiefly on the eastern side of the center of low pressure, and this upward movement results in rainfall. The rainfall is then not generally the original cause of the barometric depression, but rather an incident of the cycloidal movement of the atmosphere. The fall of the barometer during a rain storm cannot be ascribed to the simple condensation of the vapor of the atmosphere, as some have supposed, since a rainfall of one or two inches prevailing over an area 300 miles in diameter near latitude 30° produces scarcely an appreciable effect upon the barometer.

7. The progress of areas of low barometer in all latitudes is determined mainly by the same causes which determine the general system of circulation of the atmosphere; and their normal direction is changed by whatever causes may change the direction of the winds.

8. The heat which is liberated in the condensation of a large amount of aqueous vapor must exert an influence upon the movements of the air, so that while the rain is generally to be regarded not as the original cause but rather as one of the incidents of extensive cycloidal movement, if the rain area has great geographical extent, it may have a decided influence upon the amount of the barometric depression and upon the velocity with which the storm advances; sometimes accelerating its motion, sometimes retarding it, and sometimes holding it nearly stationary in position for two or three days.

The Electric Light.

The Russian Government, it appears, is turning its attention to the electric light as an illuminator for military purposes. In some experiments recently made at St. Petersburg, with the special object of increasing the distance to which the light produced by electricity may be thrown, it was found that the power of the light is greatly augmented by covering the carbon burner with a thin sheet of copper. The augmented light was sufficiently powerful to render objects visible at night at a distance of upwards of 3,000 yards.

Professor Langley's Apparatus for Eliminating Personal Equations.

A well known source of error in astronomical observations is that due to the deficiencies of the observer himself in the shape of defects in vision, perceptive power, etc. In order to eliminate this, astronomers have adopted two courses; either to find the amount of personal error in each case and apply a subsequent correction, or to diminish or eliminate the same by suitable devices during the act of observation. Professor S. P. Langley describes, in the *American Journal of Science and Arts*, and new and very ingenious apparatus for eliminating the "personal equation" on the star itself. It is constructed and operated as follows:

On the transit pier (or in any other convenient locality) is a small clock, with a conical pendulum, whose bob slides freely up and down the graduated rod, retaining its position where left. A small horizontal wheel in the clock is controlled by the pendulum, and turns once for a certain constant number of its revolutions. This wheel revolves once for each equatorial interval of the transit wires, when the bob is set at a mark near the top of the rod, and by sliding the bob sufficiently downward; with the use of a readily constructed table, we can, given the declination of any star between the limits 0° and ± 60°, set the pendulum, so that this wheel shall make exactly one revolution while the star passes from wire to wire. This wheel carries near its periphery a mercury drop or other contact piece, which once in a revolution is carried past a point fixed near the periphery of a stationary horizontal wheel, concentric with the first, and immediately above it, but insulated and entirely detached from it.

This upper wheel, while thus related to the lower, is entirely disconnected from the machinery of the clock, and is thus far stationary; but it can be revolved by cords passing from a groove in its circumference to the hand of the observer at the transit. As the upper, or ordinarily fixed, and the lower or constantly moving, wheels have a common vertical axis of revolution, and as the radial distance of the point in the upper from this axis is the same as that of the contact piece on the lower, it will be seen, while the upper wheel remains motionless, electric contact accompanied by a simultaneous flash, if we desire it, at the transit lantern or elsewhere, will be made at equal and uniformly recurrent epochs, the interval between which depends only on the adjustment of the pendulum. If the upper wheel be rotated forward by hand, through a small distance, and then left, the next contact will still occur, but at a later epoch, owing to the lower wheel's having to complete more than one revolution to make contact, but after this the contact and simultaneous flash will recur at the same intervals, and with the same regularity as before. If the upper wheel be moved backward, the flash will occur once, earlier, and thereafter with regularity. Moving the upper wheel, then, changes the epoch from which any series of such flashes dates, and adjusting the pendulum bob fixes the interval between subsequent flashes. In practice the lamp is removed from the transit lantern, and the two terminals of a battery or induction coil in its place cause the flash to be thrown upon the wires, whenever the mercury drop is in contact with the point, and at the same instant a mark is made automatically on the chronograph and interpolated in the regular record of the beats of the sidereal clock, which go on in the usual way quite independently of any reference to the apparatus just described.

The mode of observation will be anticipated. Before the transit of any star the observer adjusts the conical pendulum beside him (this is the work of but a few seconds), and then seats himself at the instrument holding the cords in one hand like the "reins" of an equatorial. If a flash occur just as a star is crossing the first wire (which is most unlikely) he has nothing to do, except possibly to note which was the middle wire, for each records itself on the chronograph without any intervention of his. But if the star be, for instance, two thirds of the way from the first to the second wire at the first flash, he will draw one of the cords, accelerating the flash and thus causing the star to appear nearly coincident with the second wire when the next spark comes, and repeat the adjustment by the light of subsequent flashes, till the bisection is perfect. Three or four trials are in practice found to yield a bisection which will satisfy a fastidious eye, and when a satisfactory one has been once made, the effect is automatically repeated.

Under the general conception, then, of the possibility of diminishing to any limit personal error, by employing brief views of the star or wire and utilizing the phenomena of persistence of vision, the particularly described device assumes to dispense with the observer's record upon the chronograph altogether, and to substitute a purely automatic one giving the same virtual result as though the image of the star were a tangible object, itself making electric contact with each wire. The share of personality in any observation is relegated to the prior act of bisecting a star, virtually motionless with relation to the bisecting wire, so that if (as seems to be the case) this act is independent of quickness or slowness of perception, of the time of cognition, or of the speed of nerve transmission; personality, in the technical sense, appears not to intervene at all.

Recent American and Foreign Patents.

Notice to Patentees.

Inventors who are desirous of disposing of their patents would find it greatly to their advantage to have them illustrated in the SCIENTIFIC AMERICAN. We are prepared to get up first-class WOOD ENGRAVINGS of inventions of merit, and publish them in the SCIENTIFIC AMERICAN on very reasonable terms.

We shall be pleased to make estimates as to cost of engravings on receipt of photographs, sketches, or copies of patents. After publication, the cuts become the property of the person ordering them, and will be found of value for circulars and for publication in other papers.

NEW HOUSEHOLD INVENTIONS.

IMPROVED SAD IRON AND FLUTING IRON COMBINED.

Christopher C. Burke, Cuthbert, Ga.—This improvement consists in forming the iron in box form with four smoothing faces, two large ones and two smaller ones, and combining it with a handle in such a manner as to be reversible, and with a heating plug or block to be inserted in the hollow iron which has four faces, corresponding to the four faces of the iron. It also consists in the particular means for connecting and disconnecting a plate carrying one of the ironing faces, to admit the insertion or removal of the plug or block, and the adjustment of a fluter.

IMPROVED RECIPROCATING CHURN.

Allen D. Ferris, Blakeley, Minn.—This invention relates to oscillating churns; and the nature of the invention consists in combining, with a semi-circular cylindrical oscillating churn box, a removable rectangular frame, having slats arranged in it in such manner that when the box is rocked rapidly the milk in it will be violently agitated, the currents being directed upward and downward by reason of the position of the dashers or slats. The slats on one side of the frame are inclined in an opposite direction to those on the other side of the frame, and the angle of inclination of the slats is such that the milk is directed both upward and downward by the same slats at each oscillation of the churn box. The currents are thus opposed to each other, and a violent agitation is produced which greatly shortens the operation of churning. The slats also serve to gather the butter when it comes.

IMPROVED COMBINED LAMP REST AND SHADE HOLDER.

Partrick J. Clark and Joseph Kintz, West Meriden, Conn.—This invention relates to an improved lamp rest and shade holder combined, by which the shade may be readily swung out of the way, and securely retained in raised position while the fount is taken off for refilling and other purposes, the fount being securely applied to the fount plate or basket, and any danger of upsetting or dropping the lamp effectually prevented. The invention consists in the connection of the lamp fount, having a central cavity, with a spring wire holder or clamp that screws the fount or basket tightly to the bracket or chandelier; and it also consists in the connection of a fount plate or basket with an adjustable rod carrying the swinging shade holder. The fount when placed on the spring wire holder is rigidly retained on the plate or basket without danger of being thrown off or detached from the same in accidental manner. The wire holder admits at the same time the ready sliding of the fount when lifted in vertical direction, for clearing, refilling, etc., and the instant replacing by pressing the fount down on the holding device. The shade or chimney is swung back on the fount as soon as the same is placed in position on the holder, being securely supported in raised position as as to remove and replace the fount and light the lamp in convenient manner.

IMPROVED BROILER AND TOASTER.

Andrew C. Bolton, Greenport, N. Y.—This invention consists of two light wire frames hinged together, and provided with a spring fastening and with a wooden handle. The object of the invention is to provide a simple and efficient device for holding meat or bread over the fire while broiling or toasting The frame is formed by bending a wire into a rectangular form, and twisting it together at the center of one of the sides of the frame. This frame is stiffened and supported by two wires which pass through the first twist of the wire that forms the frame. The wires that diverge from this point and pass under the transverse wires which are fastened to the frame, and are attached to the end of the frame opposite that in which the twist is formed. The wires and the ends of the wire that forms the frame are parallel outside of the twist, and are placed in a wooden or non-conducting handle.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED THILL COUPLING.

Francis E. Justice, Marysville, O.—The object of this invention is to provide a simple means for preventing the detachment of the thill iron except when the thills are raised to a vertical position, and also for supporting the thill ends off the ground when the carriage is not in use. The said means consists of a horizontal bar attached to the under side of the eye of the thill iron, so as to come in contact with an elastic block which is secured in the socket of the clip in such position as to act as a buffer for the said bar when the thills are lowered.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED SCROLL-SAWING MACHINE.

William Hinchliffe, Nashville, Tenn.—The object of this invention is to provide a simple easy-running scroll saw, that maintains an even tension on the blade at every portion of the stroke. The table, similar to an ordinary sawing machine table, in which the shaft of the driving wheel is journaled, and in the lower part of which is pivoted the treadle which is connected by a pitman with the crank formed in the shaft of the wheel. The saw blade is clamped to the bars by means of the clamping screws, and the position of the saw in the clamping device is determined by a pin that projects from the side of each head. The machine is operated by working the treadle, and more or less tension is given the saw by turning a screw, and by turning another screw the table may be pitched or inclined. The arrangement of the spring is such that the tension on the saw is always the same in all parts of the stroke.

IMPROVED DEVICE FOR SUPPLYING LOCOMOTIVE TENDERS WITH FUEL.

Will C. Hamner, Water Valley, Miss.—The object of this invention is to furnish an improved device for supplying locomotive tenders with coal or which shall be so constructed as to discharge the required supply into the tender at once, so as to avoid the delay which is unavoidable when the tenders are supplied in the usual way. The invention consists in the employment of a pivoted or tilting box for supplying locomotive tenders with fuel. To the platform of the railroad track are attached two posts, to the upper ends of which is pivoted a box. The box is made of such a size as to contain the quantity of coal or wood to be supplied to a tender at a time. To the side of the box is pivoted a hook latch to catch upon a pin attached to a post secured to the platform. The latch is held forward by a spring attached to the box, and its forward movement is limited by a stop pin also attached to said box, so that the latch will always be in position to catch upon the pin automatically when the box is swung back into place after being tilted to discharge its contents.

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IMPROVED SAND CONVEYOR.

Rufino C. Garcia, San Antonio, Texas, assignor to himself and Aug. Robin.—This invention relates to a machine constructed for taking up and conveying sand into a suitable receptacle. The machine may be pulled by hand or horse power over the sandy ground, the same being first loosened by a series of detachable teeth. A drum is provided with a number of circumferential cutting knives, and constructed of sufficient weight to sink them into the sand, and pack the same tightly in the spaces or sections between the knives, and is retained in the sections and carried up between the knives to scrapers, passing them over to an inclined plate that is secured rigidly on side supports of the tongue frame, and over a hinged apron to a suitable receiving box, which is supported on the tongue of the machine, and is readily dumped or removed when filled with sand. In this manner sand for various purposes is readily taken up and collected in cheap and effective manner, requiring only one attendant, either for driving the horse or pulling and discharging the machine.

IMPROVED GAS-WASHING APPARATUS.

William M. Cosh, Conshohocken, Pa.—The form of this apparatus is similar to the ordinary gas-washing box, and has an inclined longitudinal partition, which, in a transverse direction, is horizontal. A shelf or partition extends from a point near the outlet gas pipe near to the opposite end of the washing box. Plain transverse ribs or brakes project downward from the under surface of the shelf, and notched transverse ribs are placed between these ribs and project in the same direction. An inlet gas pipe leads from the gas generator, and projects downward through the partition, and an outlet gas pipe leads from the washing box. There is an overflow pipe, through which the water may escape; and a blow-off pipe for removing the water when required. A door is hinged to the lower end of the shelf, and is capable of being thrown against the end of the box by gas pressure. The operation is as follows: The box is filled with water, so as to completely cover the inclined shelf, and the supply is maintained by a spring tube, in the usual way. Gas is forced in through the pipe and follows the under surface of the shelf or partition toward the outlet pipe. In its passage it is deflected by ribs, and thrown down a number of times before reaching the upper end of the partition. By this means the gas is brought into contact with a greater surface of water than in boxes of ordinary construction.

IMPROVED VALVE GEAR FOR STEAM ENGINES.

James H. Davis and William White, Winnsborough, Tex.—The object of this invention is to furnish an improvement in steam engines which shall be so constructed as to give a full application of the steam and a free exhaust at regular intervals, which will enable the engine to be easily reversed, can be easily attached to any engine, which will enable an engine to be worked by water pressure, will run smoothly and with very little friction, and will be very durable. The crank wheel is made with a projection rim, to the inner surface of which is attached, or upon it is formed, an oval or double inclined projection or cam. The projection or cam at each half revolution of the wheel strikes against one or the other of two pins, which have rollers placed upon them to diminish friction, and are attached to a sliding bar at such distance apart that they may be struck alternately by the projection, to give a reciprocating movement to the bar. The bar slides in the bearings in the supports, and to it is attached the stem of the inlet valve, which slides in the steam chest and admits steam into the ends of the cylinder alternately. The end of the bar is pivoted to the end of an arm rigidly attached to an upright rock shaft, which is provided with two rigid arms projecting in opposite directions, and at right angles with the arms. To the ends of the arms are pivoted the outer ends of the stems of the outlet or exhaust valves, which are placed at the ends of the cylinder, and from which the exhaust steam passes directly down into the heater. The rock shaft is provided with a handle to enable it to be turned to reverse the engine.

IMPROVED TIME LOCK.

John B. Overmyer and James A. Huston, New Lexington, O.—The object of this invention is to so improve the time lock that the setting of the lock is facilitated and accomplished in a simple manner without interfering with the time pieces that work the bolt-releasing mechanism, and also the stop mechanism, arranged to be thrown at a certain fixed time in automatic manner. The invention consists of a time lock in which the releasing nut is moved by time mechanism to throw out the lever stop and release the bolt at the proper time, the nut being reset by a toothed drum gearing with the toothed nut. The lever stop is retained in position by the bottom arm of a pivoted lever that is automatically worked by the pointer of the nut engaging an adjustable disk of the retaining lever. To secure the reliable working of the lock, two or more time movements and releasing devices may be arranged, so that in case one timepiece should stop the other would release the bolt. By a proper adjustment of the disk the bolt may be thrown, while the stop is retained in raised position by an arm until the pointer, bearing against the disk, carries the arm back and allows the stop to drop. Thus the additional facility of the automatic throwing of the stop of the time lock at a certain fixed time may be accomplished, which adds greatly to the usefulness and convenience of the lock.

IMPROVED HYDRAULIC ELEVATOR.

George Ball, Springfield, Ill.—This invention is designed to furnish an apparatus for removing iron piles, steel ingots, and other heavy pieces of iron or steel from heating furnaces; also for removing, in packing-houses, dead animals from scalding vats, and for other purposes; and the invention consists of a steam or hydraulic ram, connected by suitable transmitting pulleys and ropes with standards of the different furnaces, the ram being operated by starting cords connected to the steam entrance valve, and provided with devices for exhausting the cylinder and cushioning the ram piston. For the purpose of removing a pile or other body from the furnace the cushioning and exhaust rod tappets on the ram are adjusted to give a stroke equal to one half length of the distance to which the pile is to be moved. The buggy is placed under the fore plate of the furnace door when the heater's helper takes the tongue attached to the chain, introduces them into the furnace, and grasps the pile. The helper assumes a position near the starting rope, and, when all is ready, pulls the same, at first gradually, to take up the slack of the same. Steam is thereby admitted into the cylinder of the ram, the piston propelled upward, the line of rope taken up, and the pile delivered on the buggy in good shape. The starting rope is then released by the helper, so that the spring of the lever shuts off the steam, exhausting that in the cylinder, and causing the piston head to return to its original place, ready for the next pull. In case the spring should fail to work, the whole stroke is made by the piston, until the crosshead strikes the exhaust tappet, accomplishes the exhaust, and shuts off the steam, bringing the piston back to rest.

IMPROVED GIN SAW FILING MACHINE.

Albert S. Eastham, Navasota, Texas.—This invention relates to improvements in machines for filing the saws of cotton gins in a reliable, rapid, and uniform manner; and the invention consists of a revolving circular file, that is withdrawn by suitable mechanism to admit the intermittent feeding of the gin saw one tooth, which is accomplished by a feed hand and drag or check pawl. The edges of the saw teeth are sharpened by means of reciprocating files at both sides of the saw. The rotary file is thrown out of the teeth of the saw when the saw-feeding device moves the saw, being again raised to filing position in the next notch. The file lever is weighted in suitable manner, so as to carry the rotary file back into filing position as soon as the lever is released by the rear arm of the rock lever. The rotary file is pressed against the saw with equal force, whether the same is in or out of circle, by the weight of the file lever, which weight is moved back or forward thereon to obtain the desired pressure of the file on the saw. All the saws on the cylinder can be brought to the same diameter and in circle by placing the circular file to the saw most out of circle, and to that part of the saw nearest to the center of oscillation, and passing a pin through the rear end of file lever and the rear guide post of the same.

IMPROVED TRACTION ENGINE.

Leander Walker, Dallas, Texas.—This invention has relation to traction engines for running on common roads and rails, and to be used for drawing plows, and as a motive power generally. The nature of the invention consists mainly in transmitting motion to the driving and transporting wheels by means of the friction of a long rotating shaft inclosed inside of elongated hubs of said wheels. The invention further consists in combining friction pressure wheels with the hubs of the driving wheels for increasing the friction on the latter, as will be explained. By means of the screws the wheels can be very forcibly pressed against the hubs, and any desired degree of friction produced. The power which drives the wheels acts through the medium of the axle, which may turn faster than the wheels; consequently the amount of friction can be so regulated that the wheels cannot slip on the ground, however great may be the power applied to turn the axle.

IMPROVED CANAL BOAT.

William P. Fest, Chicago, Ill.—The object of this invention is to furnish a new construction of canal boat, and improved system of propelling the same, by which the water is not agitated in the least, and the washing of the banks prevented, the propelling mechanism being arranged with equal facility in new or old boats, so as to enable them to travel at considerable speed and in either direction. The invention consists of a canal boat having a central water channel extending at the bottom of the boat from the bow to the stern, and admitting and discharging the water through apertures of equal size in the hull of the vessel. A spiral propelling screw is arranged inside of the water channel at the center of the boat, and the channel divided into arms or branches back of the same, that unite to a single channel before the water leaves the boat. The boat may be propelled with considerable speed in forward direction, and also reversed, as the screw works equally well in either direction; but when the boat is required to be regularly propelled in both directions, a second set of branch channels has to be arranged at the front part of the boat, in connection with side and lateral gates, for establishing either communication with the central channels or with the branch channels. The entire propelling apparatus of the boat takes up but a small space at the bottom of the boat, and may be built at comparatively small cost, furnishing thereby a canal boat that may be run as a towboat or as a regular canal steamer, which, by the perfectly still state of the water at the discharge opening of the stern, has not the least injurious influence on the canal banks.

IMPROVED CAR BRAKE AND STARTER.

Alexander Winston, Fayette, Iowa.—The object of this invention is to provide for street cars and other purposes an improved rotary cumulative brake, by which the power lost in stopping the car is stored and utilized for starting the same; and the invention consists of friction wheels worked by contact with the car wheel when applied by the brake lever, producing the winding up of one or more springs, and the locking of the same by pawl and ratchet devices on the shafts of the friction wheels until the pawls are released by a treadle, and the power stored up in the springs applied to the wheels for starting the car. The brake mechanism may be used in either direction, the friction wheel shafts sliding in guide slots of the car frame. As soon as the car is desired to be started the brake lever is held in backward direction, so as to press the friction wheels against the car wheels, but at the same time a treadle, operated by the foot, lifts one pawl out of the ratchet, said pawl releasing, by its pivot joint, the second pawl, so as to throw the joint power of the springs on the friction wheels, and by the same on the car wheels, assisting thereby materially in starting the car. The springs of one shaft coil in opposite direction to that of the other, so as to admit the cumulative working of the brake and starting device in either direction.

IMPROVED ENGINEERS' PLOTTING TABLE.

Albert R. Crandall, Lexington, Ky.—The object of this invention is to furnish for engineers and surveyors an improved plotting table, by which the field notes may be plotted in rapid and accurate manner at a saving of time, and without taxing the eyes to injury in the least; and it consists of a sliding and slotted table carrying the plotting paper, in connection with a base disk and the foot or clamp of the protractor and retaining weights. The foot or clamp and the protractor are arranged on a shaft vertically above the center of the base disk, the shaft having a prick point at the lower end for marking the stations. A suitable lever arrangement raises alternately the weights from the paper, and lowers the foot clamp of the protractor, or raises the foot clamp and lowers the weights, which adjust themselves by pulleys on the concaved arms. The protractor turns the paper, and is adjusted by hand, and by a tangent screw and spring clamp, to the vernier. The foot clamp carries a thread, adjustable by screws, in line with the zero points of the protractor, to set the paper by and to detect errors in case any should occur. The sliding table is operated by a micrometer screw, whose head is divided at the circumference, being arranged to turn freely on the shank of the screw, and also to be clamped to a fixed head by a thumb screw, so that each measurement may start from the zero point of the head.

NEW MISCELLANEOUS INVENTIONS.

IMPROVED FIRE ESCAPE LADDER.

Henry B. Walbridge, Brooklyn, N. Y.—The object of this invention is to provide a portable and convenient ladder, more particularly designed for use as a fire escape, but which may be used for other purposes. In construction there is a pole, having a disk or bridge piece at or near its center, over which the stay rods are stretched, which rods are fastened to the pole near its ends, and serve to stiffen and strengthen it. In one end of this pole there is a pulley, and to the other end a crosstree is attached, which is provided with two spikes or points. This pole in the present case is hinged or pivoted to a truck. A jointed or rope ladder is attached to the crosstree by means of ropes or chains, and to the free end of the said ladder a rope or chain is attached, which runs over the pulley and downward toward the foot of the ladder, and is operated by hand or by means of a suitable windlass. A brace is pivoted to the pole which is inserted in the first joint of the ladder, to keep it the proper distance from the pole. In a case of fire, when invalids or timid persons are to be removed from upper parts of buildings, a box or basket is provided, which is secured to the ladder by means of a hook. This box, together with the ladder, may be raised and lowered by means of the rope or chain.

IMPROVED LAST.

John T. Poole, Benton, New Brunswick, Canada, assignor to Samuel J. Parsons.—The object of this invention is to furnish an improved device for securing the block to the last, which shall be simple in construction and reliable in use. This last is so constructed that when the block is pushed down into place in the recess in the last a hook and catch will engage with the rear and forward edges of a plate and fasten the bar securely. When the block is to be withdrawn, a hook is inserted in the hook hole in front of the upper arm of the catch lever, and as the hook is drawn upon the catch will be raised, which will allow the hook to be withdrawn from the plate and the clock to be removed.

IMPROVED STIRRUP FOR OIL-WELL MACHINERY.

Frans A. Segerdahl, Karns City, Pa.—Stirrups as ordinarily constructed for oil pumps are liable to breakage, and are a constant source of trouble and expense. The object of this invention is to provide a stirrup which shall obviate these difficulties. The side pieces of the stirrup and the bar receives the strap from the walking beam. Shoulders are formed by drawing in the side pieces to receive the pitman. Stays or braces are formed on the stirrup, that extend from the lower end of the side pieces above the shoulder. The eyes thus formed are filled with wood or other suitable material, and the sides of the stirrup are drilled to receive bolts having beveled heads. Beveled washers having flanges that embrace the sides of the stirrup are placed under the nuts of the bolts. Stirrups as commonly made are not provided with the braces, and are constantly breaking at the shoulders. By means of this improvement this difficulty is entirely obviated.

IMPROVED ARTIFICIAL LEG.

Cornelious Collins, Albia, Iowa.—This invention consists in a novel construction of the ankle joint, whereby a perfectly free articulation is allowed without noise. The lower end of the block forming the lower portion of the limb is curved, leaving a reduced bearing, which will allow a free motion of the foot forward and backward as well as laterally. The front concave surface of the block rests upon a cushion, and is held down thereon by means of a joint formed of two bolts. The joint thus formed will allow free play, and the cushion will prevent shocks in walking. In rear of the joint is a hook, which is connected by an eye joint with a bolt fixed into the block. The hook enters a recess made through the foot section and engages loosely with a pin fixed into this section. This hook joint also allows the foot to articulate forward and backward, as well as laterally. The bottom of the foot is arched out and the space filled with hair, or some other suitable material which will prevent noise in walking and afford elasticity. The cushion thus formed is covered with a piece of leather, which forms the joint for the front section of the foot. This knee spring is a strong strip of india rubber, fastened in such manner that it will act to strengthen the leg when fixed.

IMPROVED CIGAR-BUNCHING MACHINE.

Charles H. Schneider, Cold Spring, N.Y.—This invention relates to an improved machine for making cigar bunches in rapid and uniform manner, so as to facilitate and expedite the manufacture of cigars; and the invention consists of a crank roller, a sliding roller, moving along brackets, with inclined parts and recesses, a lower adjustable roller, and of an endless band or apron, that passes around the rollers and revolves with the same. For working the machine, the binder is first placed upon the band or section of the apron between rollers, the sliding roller having been placed into forward position against the shoulders of the brackets. The filler, of any size, is then placed upon the binders, the fingers readily determining when the required quantity of tobacco is therein. The binder and fillers are then gradually pressed down between the two rollers, the sliding roller being brought forward on the inclines of the brackets until it comes into contact with another roller, when it drops into a slot and remains in fixed position therein. After the whole series of aprons has thus been filled the crank roller is revolved three or four times, and the bunches then taken out, being ready for the moulds. By arranging a number of aprons and rollers in one machine, the operator passes first along the entire series of aprons, and charges the same with binders and fillers, and turns finally the crank, forming the bunches, and throwing them out by a slight backward turn of the crank, enabling thus the turning out of a large number of uniform bunches in quick and economical manner.

IMPROVED GAME APPARATUS.

James F. Spence, Brooklyn, N. Y., assignor to himself, Calvin E. Davis, and Royal P. Wilkins.—This invention relates to games which are played with balls; and the nature of the invention consists, first, in a circular table having a central conical depression, surrounded by an inclined shelf and inclosed by a rim or guard, which is of convolute form, with one or more gates or openings leading upon the shelf, the said central conical depression being provided with radial channels flaring outwardly and adapted to receive the balls which are projected on the table, and to indicate by figures the different amounts won by the players; second, in a blowpipe of novel construction, which is provided with a spring in its enlarged end, and adapted for propelling the balls upon the table by blowing through the pipe with the mouth.

IMPROVED HAIR CRIMPER.

John Leeming, Poughkeepsie, N. Y.—The object of this invention is to provide an inexpensive, efficient, and convenient device for crimping hair. It consists of a hairpin, similar to those in common use, differing only in having the bent part that unites the two prongs straight. Around this portion a wire is wound several times, and its ends are twisted together, forming a tongue, which is a little longer than the hairpin. This wire is made of flexible material, preferably of copper. The hair is interwoven with the prongs of the hairpin in the usual way, and the wire is bent around it. This device is small and light, and quickly and easily applied, and the hair may be crimped near its roots, and without the use of clamps.

NEW AGRICULTURAL INVENTIONS.

IMPROVED HAY ELEVATOR.

Julius L. Malcolm, New Athens, O.—The object of this invention is to facilitate the hoisting of the hay from the wagon to the mow in quick and convenient manner, the carriage being returned and locked after the load is dropped to the starting point above the wagon; and the invention consists of a track beam of inverted T-shape hung from the rafters of the barn and supporting the wheeled carriage. The pulley over which the hoisting rope passes has side projections, which are engaged by a fulcrumed lever with end catches for supporting the load. The catch lever has a pendant stirrup that is raised by the sheave of the fork, so as to release the catch lever from a stop block of the track, and drop the same on the projections of the pulley, to retain load below the carriage until it arrives at the point where it is to be dropped. The catch lever is released from the recessed and curved stop block of the track by the contact of the sheave of the hay fork when the load is hoisted up to the track. The sheave raises the pendent stirrup of the catch lever, and throws the same out of the stop block, so as to clear the same and admit the forward motion of the carriage along the track. The catch lever engages then the catch pulley, and suspends thereby the load below the carriage. When the load arrives at the point where it is to be dropped, the trip cord is pulled and the fork opened. The carriage returns then along the inclined track, or by the action of the weighted cord, to its place above the wagon, where the catch lever is raised from the projections of the pulley by passing along the curved stop block, so as to release the pulley and admit the lowering of the fork to the wagon to be reloaded and hoisted as before.

IMPROVED GRAIN CRADLE.

George E. Clow, Seymour, Ind.—This improvement relates to providing a socket for the post of the cradle head, and to the construction whereby said socket is made adjustable and detachable, the object being, first, to enable the angle of the cradle head to snath and scythe to be changed at will, and second, to enable the parts composing the cradle to be separated for shipment.

NEW TEXTILE INVENTIONS.

IMPROVED CLOTH-MEASURING MACHINE.

William D. Porter, McComb, O.—This invention relates to a machine or apparatus in which cloth or other kind of fabric can be measured while being wound upon a roller. The board forming the center of a bolt of cloth or other fabric is clamped endwise between two aligned and axially adjustable rotary shafts, and as the cloth unwinds it passes over a reel, by which its length is measured, and is then wound upon a roller arranged parallel to the reel. In being unwound from said roller, it passes between two rolls and is thereby pressed and smoothed before being rewound upon the board.

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Business and Personal.

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Notes & Queries

(1) N. W. asks: How can I put a good and durable finish on walnut wood? A. Rub the work over with boiled linseed oil, and when nearly dry, rub it over with a stiff brush. Take a strip of woolen cloth about two yards long, roll it up into a hard roll. Dip one end into the boiled oil and add a few drops of shellac varnish, and rub the work previously oiled with that until a fine polish is obtained.

(2) C. H. P. asks: How many pounds will a leather belt 16 inches wide, of the strongest kind, sustain before breaking? A. The strength of a good leather belt is about 3,000 lbs. per square inch of section. From this you can readily calculate an answer to your question.

(3) G. C. P., Jr., asks: What ingredients are used in making kalsomine for walls, and the proportions? A. Kalsomine is composed of zinc white mixed with water and glue sizing. To 1 lb. glue use 15 lbs. zinc white. Soak the glue over night, and the next morning prepare as for gluing wood. Put the zinc white in a vessel and pour on hot water, stir until it appears like thick milk. Mix with the liquid glue and apply to the wall with a brush. If too much glue, the material cannot be laid on smoothly. Stir frequently while applying.

(4) J. H. W. asks: 1. How to make a good waterproof leather cement for shoemaker's use? A. Dissolve gutta percha in chloroform to the consistency of honey. Heat the surfaces to which it is to be applied, and press together. 2. Also how to make a rubber cement? A. Gutta percha 3 parts, pure India rubber 1 part, cut small, pyrogenous oil of turpentine or bisulphuret of carbon 8 parts. Mix in a close vessel and dissolve by the heat of hot water. Heat the cement gently before using.

(5) A. R. B. says: In the summer time I see the sun, as it rises, shining into my north window; now as the sun never gets as far north as the latitude in which I live, I would like to have explained how it is that its rays can come from a northern direction? A. The rays, from your statement, shine obliquely into the north window, which would not require the sun to be as far north as the latitude in which you live.

(6) J. W. H. says: 1. I am building an engine 3 x 5½ inches cylinder for a launch 20 feet long. Is it large enough to drive it 10 knots in still water? A. No. 2. With a 22 inch propeller, had I better place the shaft near the bottom of the boat, allowing the propeller to work below the keel? A, Yes. 3. With a 3 feet pitch the propeller would have to make over 400 revolutions to drive a boat 10 knots; is that too fast to run the engine? A. If the engine is well designed and built, it can be safely run at this speed.

(7) F. M. T. says: What size boiler and what size engine should I have to use to propel a boat 15 feet long, 30 inches beam, and 6 inches draught? I cannot use a screw, and with side wheels would it be better to have the connecting rod on the shaft of the wheels, or have gearing? A. You might use a geared engine 2½ x 4, with a boiler 20 inches in diameter and 3 feet high.

(8) T. S. L. asks how to kill those small wrigglers that appear in cisterns; also directions for making a filterer? A. The best plan will be to clean the cistern. You can filter the water by passing it through sand and gravel, arranged in layers.

(9) J. M. B. says: Can anything be added to glue, that will make it slightly elastic or tough when dry, without much impairing its strength? A. Try the addition of a little glycerin.

(10) A. McC. W. asks: How may grapes be preserved, in their natural state, through the winter? A. Select sound bunches, being careful not to bruise or crush them or start them from the stems, and keep in a cool, dry place.

(11) R. L. says: I wish to make about 1,000 moulds with hard glossy surface, averaging 2 inches in diameter by 1½ inches in height, to be used for wrapping paper on in rings to give these rings shape when dry? A. You might use *papier maché*, as described on p. 28 (40) present volume of the SCIENTIFIC AMERICAN. The surface might be perfected by means of a hard japan.

(12) H. W. S. says: In the issue of August 4 is an article headed $20,000 prize for a new sugar extraction process. Where is the proper address to write the parties who make this offer? A. "Director of the Interior," Basse Terre, Guadaloupe.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

J. W. F.—The clay is of fair quality—it contains some free silica, organic matter, and a little iron besides the alumina silicate. If properly washed it might find a market, or be used in the locality where mined in manufacturing pottery, etc.—E. S. W.—It is tourmaline—composed of silicic and boracic acids, potash, soda, alumina, lithia and iron oxide.—H. C. G.—There are no positive indications in the rock of any notable qualities of valuable metals or minerals. The particles of metal-like appearance are pyrites.—Box marked L. P. contains fine specimens of fluorspar—calcium fluoride. The white uncrystalline fragment is chiolite—soda alumina fluoride. The substance in paper is simply quartz sand colored by iron oxides.—A. C. A.—The alloy seems to consist of tin, lead, bismuth, a little antimony, nickel or iron, and zinc. We cannot make a complete analysis of it for you.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On the Manufacture of Rubber Hose. By H. T. M.
On Carrying a Bar of Iron. By S. B. E.
On a Mathematical Problem. By P. J. D.
On an Explosive Bullet. By P. M.
On a Rare Caterpillar. By F. W. S.
On Powder Mill Explosions. By C. H. R.
On Some Insects. By C. F. S.
On Education of Parrots. By W. B. C.
On the Locusts in Kansas. By C. V. R.
On a New Keely Motor. By M. A. J.
On Working Men and Rev. H. W. Beecher. By A. B. W.

Also inquiries and answers from the following:

W. M.—G. S. B.—J. M. F.—B. T.—T. C.—H. G. W.—F. J. T.—L. R.—E. S. G.—H. O.—L. H. P. & Co.—J. B. B.—S. A. R.—J. M. McC.—J. F. W.—J. J. P.—S. S.—E. M. W. & Co.

HINTS TO CORRESPONDENTS.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Inquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are sent: "Who builds road engines suitable for threshing wheat, and for other farm operations? What is the best institution for obtaining instruction in mechanical and civil engineering? Who sells good books on steam engineering?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

OFFICIAL.

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

August 7, 1877,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

Adding machine, M. M. Cram 193,853
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DESIGNS PATENTED.

10,138.—EMBROIDERY PATTERN.—E. Crisand, New Haven, Conn.
10,139.—STOVES.—J. Dwyer, Detroit, Mich.
10,140 to 10,142.—OIL CLOTH.—C. T. & V. E. Meyer, Bergen, N. J.
10,143.—COOKING STOVES.—J. A. Lawson, Troy, N. Y.
10,144.—BOOK COVERS.—J. Becker, Boston, Mass.
10,145.—FRAMES FOR SUGAR BOWLS.—F. Dunworth, New York city.

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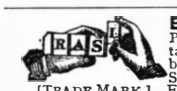

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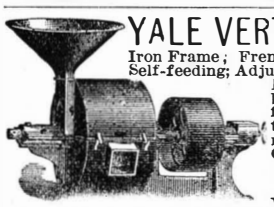

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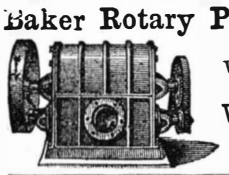

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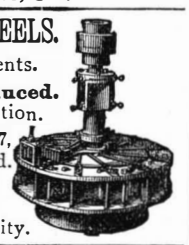

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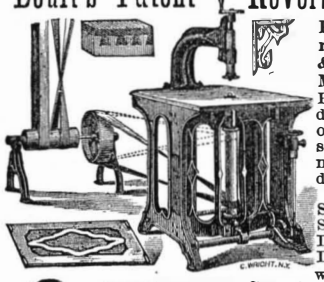

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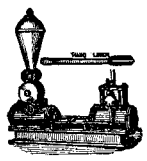

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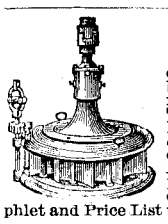

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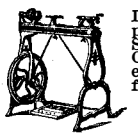

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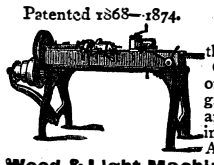

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